Ephemerides

THE Sea-Man's Kalendar,

OR,

An *Ephemerides* of the *Sun*, *Moon*, and certain of the most notable *Fixed* STARS.

ALSO,

Rules for finding the *Prime*, *Epact*, *Moon's Age*, time of *High-Water*, with *Tables* for the same; and the *Courses*, *Distances*, and *Soundings* of the Coasts of *England*, *Scotland*, *Ireland*, *France*, &c.

AND

A *Table* of *Latitude* and *Longitude*, of the Principal *Ports*, *Head-Lands*, and *Islands* in the World; first Calculated by *John Tap*: Now rectified and enlarg'd with many Additions.

VIZ.

A New exact Table of the *North-Star*, and New Tables of 65 of the Principal *Fixed-Stars*, their coming upon the *Meridian* every day; with their *Right Ascension* and *Declination*, &c.

WITH

A Discovery of the long Hidden Secret of *LONGITUDE*, by HENRY BOND, Teacher of the *Mathematicks*.

And many other Rules *and* Tables *added*, *very useful in the* ART *of* NAVIGATION.

By HENRY PHILIPPES, *Philo Nauticus*.

LONDON,
Printed for *RICHARD MOUNT* at the *Postern* on *Tower-Hill*. 1696.

C. 2563

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	h	s	d
Mickell Leahorn	0	12	0
Thomas Bartlett	0	7	6
Henery Cerlly	0	6	0
John Danes	0	2	6
Thomas Stockwell	0	2	6
John Coklem	0	2	6

MVSEVM
BRITAN
NICVM

To the Courteous READERS, *Health.*

GEntle and indifferent READERS, you who are ready to applaud that which is good, and paſs over with ſilence that which is not hurtful, without ſcoffing at the Work, or deriding the Author; and who having ſome Skill, are deſirous of more Knowledg in the *Art of Navigation*, and other *Mathematical Studies*; To you I commit the cenſuring of my Work, and heartily wiſh you the Profit of my Labours; knowing that the Wiſe will rather wink at ſmall Faults, then raſhly prove that which may profit others, not pleaſure themſelves: And though (as I ſay) the curious and expert Mariners find nothing herein contained, which may ſatisfie their Expectation, yet I hope they will judge favourably of my Intentions, and with patience paſs it over for affection to the Art it ſelf, wiſhing charitably that my Skill were anſwerable to my Will. As for the meaner Sort, whoſe Experience have not been fitted with Arts rudiment, nor their Judgment fined with demonſtrative Illuſtrations in the *Mathematical Sciences*, but only are now (as it were) ſetting themſelves with willing Minds to learn what before they wanted: I make no queſtion, but as by theſe following *Tables* and *Propoſitions* they may reap Profit; ſo accordingly, in yielding friendly Cenſures upon me and my Work, they ſhall anſwer my Expectation with full recompence of my paſſed Labours. So intreating the courteous *Readers* to do me that Favour as to Correct what they ſhall find amiſs, either in the *Printer's* Over-ſight, or of my own Errour; I ſhall not only endeavour the mending of them in the next *Impreſſion*, but be very thankful for them, when at any time they ſhall give me notice thereof, reſting withal,

Your obliged Friend,

JOHN TAP.

To the Ingenious SEA-MAN.

THis Book needs no Commendations, having for a long time paſt ſo currantly through the hands of moſt Men. Indeed it is a Compendium *(if well underſtood) of the whole* Art of Navigation *: But its chiefeſt Excellency conſiſts in the* Aſtronomical *part thereof; the* Tables *whereof are ſo plain and full, and well ordered, that there never were the like in any Book. And though theſe* Tables *are ſubject to grow old, and wear out of date; yet ſuch hath been the good fortune of the Book, and the care of the* Stationer, *that the quick ſale of the Book hath encouraged him ſtill to renew the* Tables; *for this means, the Book hath not only been preſerved in its firſt Excellency and Exactneſs, but hath from time to time received the Friendly Additions of Mr.* Henry Bond, *an Antient Profeſſor of theſe Arts. And whereas the Reviſal thereof hath lately fallen into my hands, finding the Book to be of ſo great uſe, and ſo agreable to my* Genius, *I have been the more careful to make ſuch Additions and Corrections, as will (I hope) be for the Advancement of the Book, and the Advantage of the Buyer: So wiſhing all Proſperity to attend your Sails, I reſt*

Yours,

HENRY PHILLIPPES.

Philonauticus.

ADVERTISEMENT.

AT *Gerry-Garden* on *Rotherith-Wall*, are Taught theſe *Mathematical* Sciences, *viz. Arithmetick, Geometry, Algebra, Trigonometry, Navigation*, Dyalling, *Aſtronomy, Surveying, Gauging, Fortification, Gunnery*; the uſe of the *Globes*; alſo other *Mathematical* Inſtruments; likewiſe the Projection of the Sphere on any Circle, *&c.* with other parts of the *Mathematicks*, and *Merchants Accompts.*

By *JAMES ATKINSON.*

Certain Definitions meet to be underſtood of thoſe that will practiſe Navigation.

A *Sphere* or *Globe*, is a round Figure made by the turning of half a Circle, till it end where it began to be moved; or a maſſy Body incloſed with one Platform or Surface; in the middle whereof is a Prick, from which all Lines drawn to the Surface are equal.

Centre, is the Point or Prick, in the middle of a *Sphere*, *Globe*, or other Circles.

Diameter, is a right Line drawn through the Centre to the Circumference or Surface of a *Sphere* or Circle to each end thereof.

Circumference, is a round Circle equally diſtant on all ſides from the Centre thereof.

Surface, or *Superficies*, is the upper part of any thing.

A *Degree*, is the 360 part of the Circumference of any Circle.

A *Minute*, is the 60 part of a Degree, being underſtood of Meaſure; But in Time, a Minute is the 60 part of an Hour, or the fourth part of a Degree; 15 Deg. anſwering to an Hour, and 4 Min. to a Degree.

The *Pole*, is a Point or Prick imagined in the Heavens, whereof there are two; the North Pole being a Centre to a Circle deſcribed, by the Motion of the *North Star*, or the tail of the *Little Bear*; from which Point aforeſaid, is a Line imagined to paſs through the Centre of the Earth, and paſſing directly to the oppoſit part of the Heavens, ſhewing the South Pole.

The *Equinoctial*, is a great Circle imagined in the Heavens, alſo dividing the Heavens into two equal parts, and lying juſt in the middle betwixt the two Poles, being in Compaſs from Weſt to Eaſt, 360 Degrees; every Degree thereof on the Terreſtrial Globe, valuing 20 *Engliſh* Leagues, or 60 Miles.

The *Meridian* is a great Circle, dividing the Equinoctial at right Angles into two equal parts, paſſing alſo through both the Poles, and the *Zenith*, to which Circle the Sun coming twice every 24 hours maketh the middle of the Day, and middle of the Night; every place hath a ſeveral Meridian; but they all meet in the Poles of the World.

Zenith,

Zenith, is a Point or Prick in the Heavens right over our Heads, 90 Degrees from the *Horizon*, as the Pole is 90 Degrees from the Equinoctial.

Nadir is a Point or Prick in the Heavens under our Feet, opposite to the *Zenith*.

Horizon is a great Circle dividing that part of the Heavens which we ſet from the other part we ſee not.

Azimuth is a great Circle croſſing the *Horizon* at right Angles, as the Meridians do the Equinoctial, being as many as the Meridians, and as the Meridians concur and meet together in the Poles of the World, ſo do the *Azimuths* meet in the *Zenith*, which is the Pole of the *Horizon*.

Parallels, are Lines or Circles equally diſtant in all parts one from another, as all Circles of Eaſt and Weſt are Parallel to the Equinoctial.

Almicanters, are Circles parallel to the *Horizon*, being alſo Circles of Altitude or Elevation, being that the Altitude of the Sun, Moon, or Stars above the *Horizon* are deſcribed thereby: Which *Almicanters* do croſs the *Azimuths*, as the Parallels or Circles of Eaſt or Weſt do croſs the Meridians.

The *Tropicks* are two leſſer Circles, parallel to the Equinoctial, limiting the bounds of the *Zodiack*, or the greateſt Declination of the Sun on each ſide of the Equinoctial. The *Tropick* of *Cancer* Northward, the *Tropick* of *Capricorn* Southward, whoſe diſtance from the Equinoctial are in theſe times, according to the beſt Obſervations, 23 Deg. and 36 Min.

The *Zodiack* is a great Circle, croſſing the Equinoctial in two oppoſite places thereof, and ſwerving byas-wiſe therefrom, towards either of the Poles, touching the *Tropick* of *Cancer* on the North part, and the *Tropick* of *Copricorn* on the South part thereof. In the *Zodiack* are 12 Signs, viz. *Aries* ♈, *Taurus* ♉, *Gemini* ♊, *Cancer* ♋, *Leo* ♌, *Virgo* ♍, Northern Signs; *Libra* ♎, *Scorpio* ♏, *Sagitarius* ♐, *Capricorn* ♑, *Aquarius* ♒, *Piſces* ♓, Southern Signs; every Sign being 30 Deg. in length, and 12 in breadth: Through which Signs the Sun paſſing deſcribeth a Year, and the Moon paſſing likewiſe through the ſame maketh a Month: The 12 Degrees that the *Zodiack* hath in breadth, are allowed for the Latitude of the Planets.

Ecliptick is a Circle lying juſt in the middle of the *Zodiack*, out of which the Sun never goeth; but the Moon, and other Planets, are ſometimes on the one ſide, and ſometimes on the other ſide thereof.

The *Head* and *Tayl* of the Dragon, are two oppoſit Points in the Ecliptick Line of the Zodiack, which goeth backwards through all the

the 12 Signs in 19 Years; and when it happeneth that the Sun and Moon are in Conjunction or Oppoſition in that place of the Ecliptick, where the Head or Tail of the Dragon is, then is the Sun or Moon Eclipſed: Each of the other Planets alſo have their proper Dragons Head and Tail; but this of the Moon is moſt notable in regard of the Eclipſes.

The *Polar Circles* are two little Circles diſtant from the Poles of the World, ſo much as the greateſt Declination of the Zodiack from the Equinoctial; in wch Polar Circles are the Poles of the Zodiack. The one of theſe Circles being about the North Pole, is called the *Artick* Circle; the other being about the South Pole, is called the *Antartick* Circle. Some ſay theſe two Circles incloſe all thoſe Stars which neither riſe nor ſet in any Latitude, but are always above the *Horizon*, which either of the ſaid Poles are raiſed.

The *Colures* are two great Circles paſſing through both the Poles, croſſing one another in the ſaid Poles at right Angles, and dividing the Equinoctial and the Zodiack into 4 equal parts, making thereby the 4 Seaſons of the Year: The one Colure paſſing through the Equinoctial Points of *Aries* and *Libra*, ſheweth the beginning of the Spring-time and Autumn, at which two times the Days and Nights be equal; the other Colure paſſing through the Two Tropical Points of *Cancer* and *Capricorn*, ſheweth the beginning of Summer and Winter; at two which times the Days are longeſt and ſhorteſt.

Altitude in the Heavens, is the height of any thing above the Horizon towards the Zenith.

Latitude, is the wideneſs and diſtance of the Planets or Stars from the Ecliptick, either Northward or Southward. Alſo Latitude is the diſtance of the Zenith of any place from the Equinoctial towards either of the Poles, which is always equal to the height of the Pole of the ſame place.

Longitude, is length, and in the Heavens it is underſtood the diſtance of any Star or Planet from the beginning of *Aries*, to the place of the ſaid Planet or Star; or from the beginning of any Sign to a certain other part of Degree of the ſame: Otherwiſe Longitude in the Earth, is the diſtance of the Meridian of any place from the Meridian which paſſeth over the Iſles of *Azores*, where the beginning of *Longitude* is ſaid to be. *Longitude* is counted upon the Equinoctial, and *Latitude* upon the Meridian.

Declination is a declining or diſtance of the Sun, Moon, or Stars from the Equinoctial, and is ſaid to be North or South, according to the Pole toward which it leaneth.

Am-

Amplitude is the diſtance of the riſing and ſetting of the Sun Moon, or Stars, from the true E. or W. Points of the Compaſs on the Horizon.

Aſcenſion is the riſing of any Star, or of any parts of the Ecliptick above the Horizon. *Right Aſcenſion* is the Number of the Degrees and Minutes of the Equinoctial, which cometh to the Meridian with the Sun, Moon, Star, or any part of the Ecliptick.

Oblique Aſcenſion is the number of the Degrees of the Equinoctial, which cometh to the Horizon with any Star, or any portion of the Ecliptick; in which ſort is *Oblique Deſcenſion* alſo.

Aſcenſional Difference is only the Remainer, the one being ſubtracted or taken from the other.

The *Golden Number* or *Prime*, is the time of 19 Years; in which time the Sun and Moon make all the variety of their Conjunctions, Oppoſitions, and other Aſpects.

Epact is the 11 Days and 6 Hours, which are added to the Year of the Moon, being 354 Days, to make it equal with the Year of the Sun, which conſiſteth of 365 Days ¼. By the *Prime* is found out the *Epact*, and by the *Epact* the age of the Moon.

The Suns Circle and Dominical Letter.			
1	GF	15	C
2	E	16	B
3	D	17	AG
4	C	18	F
5	BA	19	E
6	G	20	D
7	F	21	CB
8	E	22	A
9	DC	23	G
10	B	24	F
11	A	25	ED
12	G	26	C
13	FE	27	B
14	D	28	A

The *Circle of the Sun* is the number of 28, becauſe that in 28 Years all the variety of *Dominical* or *Sunday* Letters and Leap-years are expired, being that at the *29th* Year the Circle doth begin again: The uſe of which number is to find out the *Dominical* Letter for any Year paſt, preſent, or to come: Where note, that there is but ſeven Letters which ſerve for *Sunday* Letters, (*viz.*) *A.B,C, D,E,F,G.* And albeit that in the days of the Week they proceed according to their natural Order of the Alphabet, yet in the Years they go backwards: As if *G* were for one Year, *F* ſhall be for the next; and when it is Leap-Year, (which is every fourth Year) then is there two Letters for the Year, the firſt ſerving from the firſt of *January* till St. *Matthias*'s Day, which is then the *25th* of *February*, and then the other Letter takes place, and ſerves till the Year's end.

To find which Number of the Sun's *Circle*, and conſequently the *Dominical* Letter for the Year propoſed: To the Year of our Lord add 9, that total divide by 28, and that which remains is the *Circle* of the Sun for that Year. Then to know the Domin. Letter; Note that the 28 Year the Domin. Letter is *A*, and

is the third from the Leap-year, therefore the first to begin withal again, is *G F*, because it is another Leap-year: And so counting the 7 Letters backwards, and every fourth Year counting two Letters; that Letter upon which the Number of the Sun's *Circle* ends, shall be the *Sunday* Letter for the Year proposed.

As for Example.

Let the Year proposed be 1677, add 9 thereto, and it makes 1686; that being divided by 28, the Remainder is 6, the Circle of the Sun: Then counting 6 Letters backward, according to order, till I have counted six places, beginning with *G F*, thus; 1 *G F*, 2 *E*, 3 *D*, 4 *C*, 5 *B A*, *&c.* I find the sixth place ends upon *G*, which I conclude to be the Dominical Letter for the Year aforesaid. And it is the first after Leap-year.

And hereit is to be noted, that the *Prime* and *Dominical* Letter changes the first day of *January*, and the *Epact* the first day of *March*.

To find out the Prime.

DIvide the Year of our Lord by 19, and to that which remaineth after the Division, add 1: The Product is the *Prime* number for that year.

As for Example.

I would know the *Prime* for the Year 1677. Divide 1677 by 19, and you shall have in the Quotient 88, and after the Division there rests 5, unto which if you add 1, it makes 6; which is the *Prime* for that year 1677.

To find out the Epact.

ADD to the Epact of the year past 11, and if it pass 30, take away 30; and the Product is the Epact for all that Year: But otherwise, which is the better way; imagine 3 places upon your Hand, which for Example, let be the 3 Joints of your Fingers, and call or name the first Joint 10, the second 20, the third 30; then count the Prime number upon the 3 Joints aforesaid, and going over them until you come to the end of the said Prime Number, mark upon which your Prime ends; and adding the Number of the Joints with the Prime, if they come not to 30, that shall be the Epact for all that Year: If they pass 30, take away 30, and the Remainer is the Epact; if it be just 30, then is the Epact equal to the Prime.

Prim.	Epact.
1	11
2	22
3	03
4	14
5	25
6	06
7	17
8	28
9	09
10	20
11	01
12	12
13	23
14	04
15	15
16	26
17	07
18	18
19	29

As for Example.

The Year 1677, the Prime is 6, and imagining the first Joint of my Finger to be 10, the second 20, the third 30; I count upon the three Joints 6, the Prime Number 1, (*viz.*) upon the first Joint I tell 1, on the second 2, on the third 3. Again, on the first 4, the second 5, the third 6, which is the Prime ending upon the third Joint 30; therefore the Number for the Epact of the Year 1677 is 6, equal to the Prime aforesaid.

To know the Moon's Age.

ADD to the day of the Month, the Epact; and so many days more, as are Months from *March*, to the Month you are in, including both Months, and if they come not to 30, so much is the Moon's Age: But if they pass 30, take away 30, and the Overplus is the Moon's Age.

This is when the Month hath 31 days; but if the Month hath but 30 days, you must take away but 29, and the rest is the Age aforesaid; for in those Months that have 31 days, the Conjunction is the 30*th* day of her Age; and those Months that have but 30 days, the Conjunction is the 29*th* day of her Age.

For Example.

The first of *January*, 1677. I desire to know the Age of the Moon: because the *Epact* changeth not till the first of *March*, I add the *Epact* of the Year before, which is 25, and the day of the Month 1 together, which makes 26; then *January* being the 11*th* Month from *March*, added thereunto, makes 37; taking 30, there remains 7, which is the Age of the Moon, the said first of *January*, 1677.

A Declaration of the following Instrument, for the Tides.

THIS Instrument gives you a plain and easy Order for the shifting of the Sun and Moon for every day of her Age; and also it is a ready and most necessary reckoning of the Tides, whereby also is shewn the common Order, to bring thereby the 32 Points of the Mariners Compass to the 24 Hours of the Day and Night, which are the first Rudiments to be learned of a young Scholar, or Apprentice in *Navigation*.

First, here is the Mariners Compass, with the XXXII Points thereof plainly set down, the Names being printed upon each several Point, which must be perfectly learned without Book; then is there in the uttermost Edg a Circle divided into 24 parts, which signify 24 Hours of the Day and Night; where you may see that twelve a Clock at Night is just upon the North Point of the Compass, twelve at Noon upon the South Point of the Compass: At six a Clock in the Morning upon the East, and at six at Night upon the West Point of the Compass; and so for the other Points of the Compass agreeing with the other Hours, every Point of the Compass makes $\frac{3}{4}$ of an Hour; as you may see North and by East is upon $\frac{3}{4}$ of an Hour past twelve, North North-east one Hour and $\frac{1}{2}$, North-east and by North two Hours and $\frac{1}{4}$, and so of the rest.

Also to the Centre of the Compass is fixed a moveable Circle, to turn round about the said Compass, the uttermost Edg whereof moving close within the Circle of Hours, is divided into 29 equal Parts and a half, signifying the days of the Moon's Age, which are numbred in Arithmetical

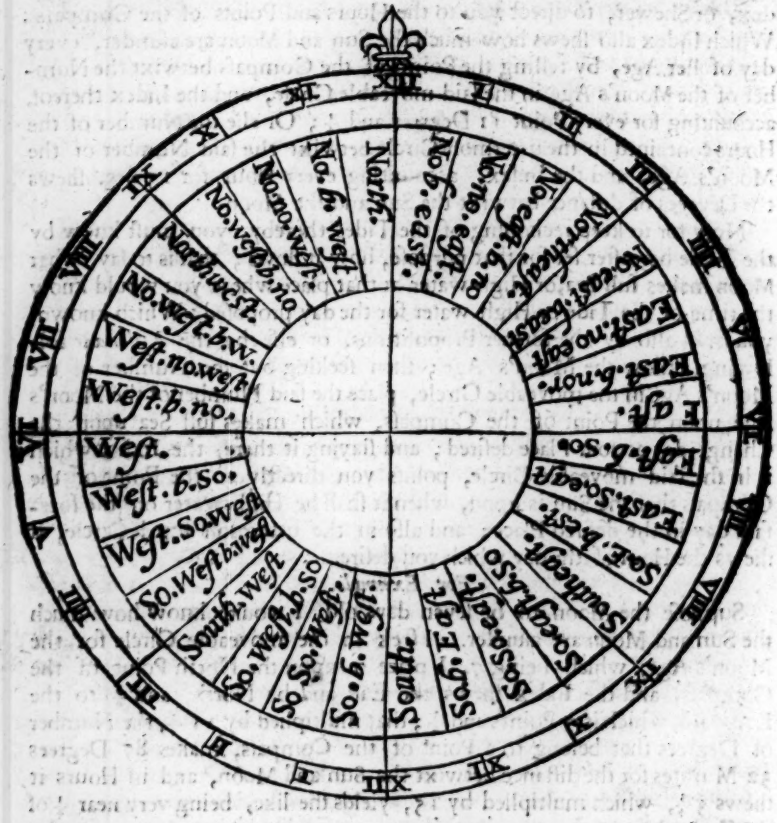
cal Figures from the first day of her Age, to her Conjunction or meeting again with the Sun, at which place of her Conjunction is left a little Index, or Shewer, to direct you to the Hours and Points of the Compass: Which Index also shews how much the Sun and Moon are asunder, every day of her Age, by telling the Points of the Compass betwixt the Number of the Moon's Age in the said moveable Circle, and the Index thereof, accounting for every Point 11 Degrees and ¼; Or else the Number of the Hours contained in the uttermost Circle betwixt the said Number of the Moon's Age, and the Index, accounting every Hour for 15 deg. shews the Degrees of distance betwixt the Sun and the Moon.

Now for to keep reckoning of the Tides thereby, you must know by the Table hereafter set for that purpose, how it flows; that is to say, what Moon makes full Sea, or High-water at that place where you would know the time of the Tide or High-water for the day proposed: Which known, you must also by the former Propositions, or else by the *Kalendar* following, know the Moon's Age; then seeking out the Number of the Moon's Age in the moveable Circle, place the said Number of the Moon's Age upon the Point of the Compass, which makes full Sea upon the Change-day at your Place desired; and staying it there, the Index which is in the said moveable Circle, points you directly to the Point of the Compass that the Sun is upon, when it shall be High-water on the foresaid day in the desired Place; and also in the uttermost fixed Circle, it shews the Hour of the day which you desire.

For Example.

Suppose the Moon to be seven days old, I would know how much the Sun and Moon are asunder. I seek in the moveable Circle for the Moon's Age, which being 7, I place 7 upon the North Point of the Compass, and the Index shews the East and by North, and ¼ to the Eastward, which is 7 Points and ¼; that multiplied by 11 ¼, the Number of Degrees that belong to a Point of the Compass, makes 87 Degrees 32 Minutes for the distance betwixt the Sun and Moon, and in Hours it shews 5 ¾, which multiplied by 15, yields the like, being very near ¼ of the Zodiack.

Then for the Tides at *London-Bridg*, it flows South-west and North-east, or is High-water at three a Clock on the Change-day; therefore when the Moon is 7 days old, I place 7 the Moon's Age upon the Point South-west, or 3 a Clock, and staying the moveable Rundle there, I see that the Index shews almost North-west, which is 40 Minutes neerest hand, or near 3 quarters of an Hour past 8 a Clock, at which time shall be High-water at *London-Bridg*, the Moon being 7 days old.



Again, at *Harwich*, where it flows South and by East, the Moon being 10 days old, I lay 10 (the Moon's Age) upon that Point of the Compass South and by East, and then the Index shews the Point West North-west of the Compass, and in the Circle of Hours one third part of an hour past 7, which is the time of Full Sea at *Harwich*, the Moon being 10 days old.

But

But if you want a Table, or Instrument, to work the Account of the Tides, you may do it by memory, multiplying the Moon's Age by 4, and divide the Product by 5; and for the Quotient, add for every Unit which remains upon your Division 12 Minutes, that Total add to the Hour that it makes full-Sea on upon the Change-day, the Product shall be your desired Number.

As in the former Example, the Moon 7 days old, and the High-water at *London* on the Change day at 3 of the Clock; I multiply 7 (the Moon's Age) by 4, it makes 28, that divided by 5, the Quotient is 5, and 3 remains upon the Division, which 3 being so many times 12 Min. makes 36 Min. which added to 5 in the Quotient, makes 5 Hours 36 Min. that added to 3 the Hour of full-Sea upon the Change-day, makes 8 of the Clock, and 36 Min. as aforesaid.

An exact way for the Tides.

HOW necessary (nay of what necessity) the true Account of the Tides are, every Man that takes a Charge (at least he that takes care of his Charge) doth very well know; and yet no one thing (by most Men) more grosly slubber'd over than this; for there is only a general Rule used, as if all Places were under the North-Pole, where the Equinoctial is the Horizon, and that the Departure of the Moon from the Sun were at all times equal; in both which respects the Rule is most grosly abused; for in North Latitude 51 Degrees 30 Minutes, the Moon being in *Cancer*, and having 5 Degrees North Latitude, it is 30 Minutes past 10 of the Clock, before the Moon will be South-east, and at 30 Minutes past 1 of the Clock, the Moon will be South-west; and for any Point nearer to the East or West, the Error will be greater. Also, if it be in 30, or 40 Degrees of Latitude, the Error will be far greater.

The mis-account of which time from a High-water, may cast away Ship and Goods, in going into Harbour where Water is scarce, where it is to be looked unto and respected. To correct this Error, I will here propound a very exact, easy, and speedy way to account the Tides:

First, You must understand, that in observing the Tides, the best way is to go by the time of the day shewed by the Instrument, and not by the Moon's being upon such a Point of the Compass: My meaning is thus, The Table shews it is High-tide at *London*, the Moon being South-west and

and this by the Inſtrument is at 3 a Clock on the day of the new or full Moon. Now it is true, it is always High-tide at *London* at 3 of the Clock on the day of the new or full Moon: But if you ſhall obſerve the Moon in the Heavens by your Compaſs, you ſhall find, that the Moon is not always South-weſt at 3 of the Clock upon the day of the new and full Moon.

For Example.

At the New Moons in *June*, and the Full Moons in *December*, the Moon is about the Tropick of *Cancer*, and then in the Latitude of *London*, ſhe is South-weſt at 3 quarters of an hour paſt one of the Clock, but it is not High-tide till three of the Clock, and then the Moon will be Weſt South-weſt, which is two Points further.

Alſo, 'tis very neceſſary to obſerve the difference which is between the Neap-Tides, when the Moon is in the quarters, and the Spring-Tides at the new and full Moon. For the Neap-Tides will be an Hour and ſomewhat more ſooner than the Inſtrument doth ſhew them.

For Example.

The Moon being in the firſt Quarter, the Inſtrument ſhews that it is High-Tide at *London*, at 9 of the Clock: But if you obſerve the time of the Tide, you ſhall find that it is High-tide before 8 of the Clock. The like difference (I believe) is in other Places. Therefore to know the true time of the Tide, you muſt ſubtract ſome Minutes from the time ſhewed by the Inſtrument, according to the Age of the Moon, as is ſhewed by this little Table.

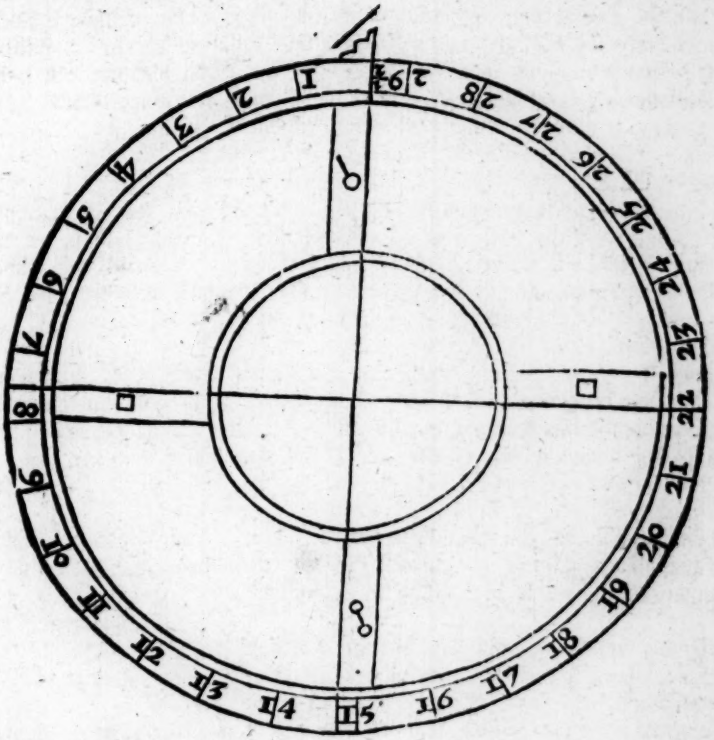
The Moon's Age.					H.	M.
1	14	16	29	Subtract	0	00
2	13	17	28		0	05
3	12	18	27		0	10
4	11	19	26		0	20
5	10	20	25		0	30
6	9	21	24		0	45
7	8	22	23		1	00

For Example.

The Moon being 5 Days old, it is High-Tide at *London* by the Inſtrument at 7 a Clock; but you muſt by this Table ſubtract 30 Minutes from this time, and ſo the true time of the Tide at *London* is at 6 of the Clock and 30 Minutes.

The Government of the Planets.

Divers Writers have diſagreed concerning the Planetary Hours; ſome making the Hours of the Planets equal with the Hours of



The Four white Quarters within the utmoſt Circle to be cut out, and then the Figure to be placed upon the Compaſs on the former Leaf.

The Four white Quarters within the
Circle to be cut out, and then the
Figure to be placed upon the Compass
on the former Leaf.

of the Clocks, and ſo continuing their Regiment orderly with the other common Hours; ſome again, beginning the ſaid Planetary Hour at Noon, ſome at Midnight, and ſome again at Sun-riſing: which indeed for the time of the beginning of the Accompt, is beſt, and for the difference of the Equality and Inequality between the Planetary Hours, and the common hours of the Clock. *Gemma Friſius*, agreeing with the beſt Aſtronomers, ſaith, That as the Days and Nights do increaſe or decreaſe, ſo muſt the Planetary hours be longer or ſhorter accordingly; nevertheleſs, ſo that there ſhould be 24 Planetary hours in the Day and Night, as well as of other Hours: But that if the Day conſiſt of more than 12 Hours, then proportionably the Planetary Hours to conſiſt of more than 60 Min. And if the Day be leſs than 12 Hours, then the Planetary Hours are to be leſs than 60 Min. and if the Day be juſt 12 Hours, then the Planetary Hours are equal to the Hours of the Clocks, and not otherwiſe. The like is to be underſtood in the Nights, and to make an Equality of the Planetary Hours to them of the Clocks, being that how long ſoever the Day is, yet there muſt be but 12 Planetary Hours; and how ſhort ſoever the Day is, there muſt (nevertheleſs) be 12 Planetary Hours, which are ſometimes greater, and ſometimes leſs than the common Hours of the Clock, which always conſiſt juſt of 60 Minutes: Therefore if you divide the Day into 12 equal Parts, one of theſe Parts ſhall be the quantity of a Planetary Hour, which you may do thus; Multiply the Hours of the Day into Minutes by 60, and if there be any odd Minutes, add them to the Product, the Total being divided by 12, the Quotient ſhews the number of Minutes contained in an unequal or Planetary Hour.

And again, if at any Hour of the Day or Night, you know not what Planetary Hour it is, that is to ſay, how many Planets ruled ſince the beginning of the Day or Night propoſed, multiply the Number of the Hours paſt, from Sun riſing by 60, and divide the Product by the number of the Minutes contained in an unequal or Planetary Hour, the Quotient will ſhew you how many Hours and Minutes of the Planets are paſt from Sun-riſing (if it be in the Day) or from Sun-ſetting, (if it be in the Night;) which known, enter the Table following, to know what Planet rules that Day and Hour propoſed, looking for the Hour deſired in that Column, which is right under the Day propoſed: Thoſe Planets which are Governours of the ſaid Hours in the Day-time, being placed on the ſide next the left Hand, and the Governours of the Night next on the right Hand.

Governours of the Day.	Sunday.		Monday.		Tuesday.		Wednesday.		Thursday.		Friday.		Saturday.		Governours of the Night.
Sol	01	11	09	00	10	00	11		Jupiter
Venus	02	00	10	00	11	01	12		Mars
Mercury	03	00	11	01	12	02	00		Sol
Luna	04	01	12	02	00	03	00		Venus
Saturn	05	02	00	03	00	04	01		Mercury
Jupiter	06	03	00	04	01	05	02		Luna
Mars	07	04	01	05	02	06	03		Saturn
Sol	08	05	02	06	03	07	04		Jupiter
Venus	09	06	03	07	04	08	05		Mars
Mercury	10	07	04	08	05	09	06		Sol
Luna	11	08	05	09	06	10	07		Venus
Saturn	12	09	06	10	07	11	08		Mercury
Jupiter	00	10	07	11	08	12	09		Luna
Mars	00	11	08	12	09	00	10		Saturn

Example.

The 17*th* day of *May*, being *Sunday*, at 9 of the Clock in the Morning, I would know what Planet rules: Firſt, in the following Kalendar, I find that the 17*th* of *May*, the Day being 16 Hours long; therefore I multiply 16 Hours by 60 Minutes, and the Product is 960. That divided by 12, brings in the Quotient 80 Minutes, for the length of the Planetary Hour at that time; then from four of the Clock, (the time of the Sun's Riſing) till nine a Clock, the Hour propoſed, is 5 Hours, which multiplied by 60, brings 300, that divided by 80, (the length of the Planetary Hour) brings in the Quotient 3 Hours, and there remains upon the Diviſion $\frac{60}{80}$ Parts, that is, three Quarters of a Planetary Hour more: So I conclude, that at nine of the Clock, three Planets have paſt their Regiment, and the fourth hath ruled three Quarters of his Hour: Therefore under the Title *Sunday* in the top of the Table, I look for 4 towards the Foot of the ſaid Table, againſt which on the left-hand is placed *Luna*; therefore I ſay, that the 17*th* of *May*, being *Sunday*, at 9 of the Clock in the Morning, *Luna* ſhall have reigned three quarters of her Hour.

A Rutter for the Courſes round about Ireland, *from Cape to Cape, and what Tide it makes in every Harbour, and how many Leagues it is from Harbour to Harbour.*

IN *Primis*, from *Cape Cleer* to the *Miſon-head* is 7 Leagues, and lieth Weſt and by North, and Eaſt and by South; you ſhall find a Haven North-weſt about 3 Leagues from *Cape-Cleer*, called *Crook-Haven*, and it floweth there Eaſt North-eaſt, and Weſt South-weſt; you muſt go Weſt to enter into it.

From

From the *Miſon* to the *Dorſeys*, is 7 Leagues, and lieth Weſt North-weſt, and Eaſt South-eaſt.

Beer-haven lieth from the *Miſon-head*, North North-weſt 3 Leagues and a half: You muſt go North-weſt into the Haven; it floweth Eaſt North-eaſt, and Weſt South-weſt: If you will anchor between *Dorſeys* and the Main-land, you muſt go aboard the Iſland, for the Eaſt-ſide is not ſound.

Without the *Cape Dorſey* lie 3 great Rocks; the Weſtermoſt is called the *Bull*, the middlemoſt the *Cow*, the other the *Calf*: They be ſound, and you may go within them, or elſe between them, for there is no danger, but what you may ſee.

Dorſeys and *Blaskey*, lie North and by Weſt, and South and by Eaſt, and there is betwixt them 12 Leagues; the *Shellocks* are 3 great Rocks lying between both, and it floweth North-eaſt, and South-weſt.

North-eaſt off the great *Shellocks*, at 2 Leagues off you ſhall find the entry of the Iſland *Valentia*, you muſt run Eaſt South-eaſt to enter in, it floweth Eaſt North-eaſt; you muſt borrow of the Iſland to enter in, for the Point on the Eaſt-ſide is long.

North North-eaſt of the great *Shellocks* 6 Leagues off, you ſhall find the Haven of the *Ventry*, which is a good Road: It floweth Eaſt North-eaſt.

North-eaſt by North off the great *Shellocks*, 7 Leagues, you ſhall find the Haven of *Dingle*, and without the Haven is a Rock called the *Crow*, which is ſound on both ſides: The Rock doth not cover but on a Spring-tide; you muſt run North-weſt and by Weſt into the Haven, it floweth Eaſt North-eaſt, and Weſt South-weſt.

The *Ventry*, and the Sound of *Begenny*, lieth South and by Eaſt, and North and by Weſt 3 Leagues; and when you are paſſed into the Sound of *Begenny*, you muſt lie Eaſt and by North into the Road againſt a Red Cliſt, which is on the South ſide.

South-eaſt of the Sound of *Blaskey*, at 6 Leagues off, you ſhall find a good Harbour named *Begenny*, which is to the North-eaſt of *Valence*: the ſaid Haven hath two Entries, but the Weſt ſide is the beſt: You muſt take great heed of a ſunk Rock that is on the Iſland ſide, which you muſt leave on your Larboard ſide going in, and it floweth Eaſt North-eaſt, and Weſt South-weſt.

You ſhall underſtand, that the Sound of *Blaskey* lieth South-eaſt and North-weſt; there runneth through a very ſtrong Tide, as well of the Flood as of Ebb.

From *Blaskey* to *Smirrisk* is 3 Leagues; and if you enter into the Haven, you muſt go South-weſt into it: It floweth Eaſt North-eaſt, and Weſt South-weſt.

There is a very high Hill to the East-ward of *Smirrick*, which is called *Sinbrandon*, they that come from the Westwards ſhall ſee that Hill firſt before any other Land; go from *Smirrick* East North-eaſt, and you ſhall go with *Lupis-Head*, which maketh entry of the River of *Limerick*, on the North-ſide: There is from one to the other 10 Leagues.

Smirrick and the Haven of *Limerick* lie North-eaſt and South-weſt, 9 Leagues aſunder, and there is within the Bay ſome Iſlands called the *Hoggs*.

From *Lupis-Head* to the *Seatrick*, is 7 Leagues, they lie East North-eaſt, and Weſt South-weſt; and if you enter into the River, take heed of a Shoal half-way between *Lupis-head* and an Iſland called *Seatrick*, which you muſt leave on the South ſide, and to the Eaſtward of that Iſland is a good Road: it floweth East North-eaſt and Weſt South-weſt.

From *Seatrick* to *Quoin* is 5 Leagues; You muſt go East, and you ſhall find two Iſlands, they be flat Iſlands; go to the Northwards hard aboard them, and from thence run East North-eaſt, and you ſhall find a Rock called the *Great Beef*, go hard aboard the South-ſide of the ſaid Rock called the *Great Beef*, and when you are at the ſaid Rock, you muſt row South-eaſt, and you ſhall find another Rock called the *ſmall Beef*, then go with the Iſland of the entry of *Dorſey*, and borrow aboard the Iſland as near as you can, for fear of the Bank going into the Haven, and you muſt moor at the Caſtle by your Cables, for there goeth a great Tide, it floweth East North-eaſt, and Weſt South-weſt.

The Sound of *Blaskey*, and the Iſlands of *Arran*, lie North North-eaſt, and South South-weſt; and there is between them 16 Leagues: The Iſlands lie East and Weſt, and make the entry of *Galloway*, and of the other Iſlands: There is one which is naught, but the Weſt Sound is good, and the next Sound to it is good, which is called the little Sound; but the Sound coming from the East is naught, but the next coming to the *Black-ſhore* from the East is partly good, but you muſt put the two Partitions to the Iſland, for it is dangerous: You muſt underſtand that there is one Iſland in the Courſe way betwixt *Lupis-head*, and the entry of *Galloway*, that hath a great Ranny, a League and half off the main Land.

If you go before the Town of *Galloway*, go aboard the *Black-ſhore*, and bring the *Black-ſhore* South-eaſt of you, then go North-eaſt, and you ſhall fetch the Iſland called *Mutton Iſland*, and there is between them both 3 Leagues: You muſt not truſt to the North-ſhore, for there is a Shoal half-way to the *Black-ſhore*, and the Iſland of *Mutton* is thwart of two white Points, which is on the North ſide.

The ſaid Shoal is upon the Weſt South-weſt ſide of the ſaid Iſland of *Mutton*,

Mutton, a League and a half off, at low Water of Spring-tides, then ſhall you ſee it dry, and it floweth at the ſaid Iſland Eaſt North-eaſt, and Weſt South-weſt.

The Sound of St. *Gregory*, and the Road of *Galloway*, lie Eaſt North-eaſt, and Weſt South-weſt, and there is betwixt them 8 Leagues.

The Sound of St. *Gregory*, and *Slyne-head*, lie South-eaſt and North-weſt, and the diſtance between them is 9 Leagues.

From *Slyne-head* to *Ackle-head* the Courſe is North, ſomewhat Weſterly 11 Leagues; betwixt both lie three Iſlands before a great Bay; that next to *Ackle-head* is called *Cleer*, the middlemoſt *Bock*; within is a Road Men may anchor in 4 Fathom, the Southermoſt is called *the Horſe*.

Between *Ackle-head* and *Slyne-head*, within the Land lieth a very high Hill, called St. *Patrick*'s Hill, and may be ſeen far off at Sea.

Black-rock is an Iſland which is Weſt of *Ackle-head*, a League off the Cape, and the ſaid *Black-rock*, and the *Stags* lie North-eaſt and by North, and are diſtant 12 Leagues.

From the ſaid *Black-rock* run North and by Eaſt, and you ſhall find the Iſland of *Eneski*, and there is between them 2 Leagues.

South South-weſt, 2 Leagues off the *Stags*, there is a Haven called *Broad-Haven*: The *Stags* and the Cape of *Tellen* lie North-eaſt and South-weſt, and are diſtant 15 Leagues.

Betwixt the *Stags* and the Cape of *Tellen* in the Bay, is the Haven of *Moy*, the Haven of *Potway*, the Haven of *Sleigo*, the Haven of *Ballaſhaven*, the Haven of *Dongal*, the Haven of *Kilbeg*, and the Haven of *Tellen*.

The Cape of *Tellen*, and the Iſland of *Arran*, lie North North-eaſt and South South-weſt, and are diſtant 7 Leagues.

The Iſland of *Raghlenbourn*, and *Tellen*, lie South-weſt and North-eaſt, and are diſtant 2 Leagues.

The Iſland of *Raghlenbourn*, and the Iſland of *Torre*, lie North North-eaſt, and South South-weſt, and are diſtant 14 Leagues.

To the Eaſtward of *Torre*, is a Cape called *Hornhead*, and are diſtant 2 Leagues: South-eaſt of *Hornhead*, is a Haven called *Sheep-Haven*, it floweth Eaſt and Weſt, but you ſhall have in the Bay a good Road for all Winds; the ſaid Haven is a broad Haven, and is 2 Leagues from the Cape.

From *Loughſwilly* to *Sheep-Haven*, Weſt South-weſt weſterly, 4 or 5 Leagues: The Land about *Loughſwilly*, is the higheſt Land of the whole North Coaſt of *Ireland*, and is eaſy to know, by them that come from the North, and fall with the Land thereabouts.

Hornhead, and the entry of *Loughfoil*, lie Eaſt North-eaſt and Weſt South-weſt, and are diſtant 6 Leagues.

The

The entry of *Lough-foil*, and the Iſlands of *Eneſterhould*, lie North-eaſt and South-weſt, and are diſtant 5 Leagues.

The Iſland of *Torre*, and the Iſland of *Eneſterhould*, lie Eaſt by North, and Weſt by South, and are diſtant 9 Leagues.

The entry of *Lough-foil* and *Eneſterhould*, lie South-eaſt and North-weſt, and are diſtant 5 Leagues.

The Iſles of *Eneſterhould* and *Skirris-Portruſh*, lie Eaſt South-eaſt, and Weſt North-weſt, and are diſtant 10 Leagues.

You muſt underſtand, that the River of *Lough-foil*, lieth from *Skerris-Portruſh*, Weſt South-weſt, and Eaſt North-eaſt, and there is between them the River of the *Bant:* There is between *Portruſh* and *Lough-foil*, 5 Leagues: There is in the entry of *Lough-foil*, a Sand which is called the *Tuns*, which is dangerous for any Ship of Charge: Alſo there is a Channel on the Eaſt ſide of the *Tuns*, hard aboard the Shore; but you muſt have your Tide: It floweth Eaſt and by South, and Weſt and by North. *Skerris* and *Portruſh*, lie South and North, and are diſtant 12 Leagues. *Skerris*, *Portruſh*, and the Iſlands of the *Raghlings*, lie North-eaſt and by Eaſt, and South-weſt and by South, and are diſtant 5 Leagues: It floweth in *Skerris* Eaſt South-eaſt, and Weſt North-weſt; the Flood cometh from the Eaſtward.

Off the *Raghlings* is a Cape called the *Fair Foreland*, and betwixt them is a League and a half: The *Fair Foreland* and the *Knee* lie South South-eaſt, and North North-weſt, and are diſtant 9 Leagues.

The *Fair Foreland* and the *Loughrian* in *Scotland*, lie Eaſt South-eaſt, and Weſt North-weſt, and are diſtant 15 Leagues.

There is betwixt the *Knee* and *Carick-fergus*, 5 Leagues.

The Point of *Loughrian*, and the Iſlands of *Commoras* off *Scotland*, lie North and South; you muſt paſs by *Ellifo*, and by the Haven of *Lambach*, aſunder 7 Leagues.

The Point of *Loughrian* and *Copland* Iſles, lie North-eaſt and South-weſt.

The *Knee* and the Rock of *Maidens*, lie North-eaſt and by North.

The *Knee* and *Elſe* in *Scotland*, lie North-eaſt and by Eaſt, diſtant 10 Leagues.

Lorian in *Scotland*, and the Mould of *Galve*, lie South South-eaſt, and North North-weſt, and are diſtant 7 Leagues.

The Mould of *Galve*, and the *Calf* of *Man*, lie South South-eaſt, and North North-weſt, and are diſtant 10 Leagues.

The *Copland* Iſles, and the Road of *Knock-fergus*, lie Eaſt and Weſt, and are diſtant 4 Leagues: It floweth in the Sound, Eaſt South-eaſt, and Weſt North-weſt.

Copland

Copland Isles, and the Point of the *Moulens*, lie South South-east, and North North-west, and are distant 7 Leagues.

The Point of the *Moulens*, and the Isle of *Lambay*, lie South South-west, and North North-east, and are distant 21 Leagues.

Lambay and *Carlingford*, lie North North-west, and South-east, and are distant 18 Leagues.

Lambay, and the Isle of *Dalkie*, lie South South-west, and North North-east, and are distant 5 Leagues.

The Banks of *Wicklow* begin thwart of the North of *Dublin*, and continue to the Isle of *Tuskar*; they lie North and by West, and South and by East, and they lie in length 24 Leagues.

From the *Tuskar* East by South, about 8 Leagues, lieth a great Rock with many small Rocks round about, called *Nascus*: He that cometh from *England*, and saileth toward *Ireland*, must take good heed thereof, especially when through westerly or northerly Winds, he shall be driven to the Eastwards of the Course.

Tuskar and the Point of *Grenore*, lie East and by North, and West and by South, distant 2 Leagues.

And when you are bound to the Eastward off the *Grenore*, you must keep the Mountain of *Wexford* above the low Land, and so you shall go clear of all dangers betwixt you and the Shore; but if you close the Mount with the low Land, you shall go in danger.

Tuskar and the Cape of *Cornwal*, lie South and by East, and North and by West, 40 Leagues.

Tuskar and the *Saltees*, lie East North-east, and West South-west, distant 6 Leagues.

The *Saltees* and *Silly*, lie South and North, and are distant 33 Leagues.

The *Saltees* and the Tower of *Waterford*, lie East and West, and are distant 5 Leagues.

The Town of *Waterford*, and the Isle of *Ballecotton*, lie South-west and by West, and North-east by East: But between the Tower of *Waterford* and *Ballecotton* is a Haven called *Vognal*, and a Sea-board off it, is an Island called *Capel-Isle*, and between *Capel-Island* and *Ballecotton* is 4 Leagues.

The Tower of *Waterford* and *Helvick-head*, lie East and West, distant 3 Leagues.

Capel-Island and the Island of *Ballecotton*, lie West South-west, and East North-east, and are distant 3 Leagues and a half.

Ballecotton and *Cork-haven*, lie West and by South, and East and by North, and are distant 3 Leagues and a half.

The

The Haven of *Kinſale* lieth from the *Old-head* East 2 Leagues; and going in, you muſt keep *Bane-Caſtle* open to the Weſt-land.

The *Old-head* and *Cape-Cleer*, lie Weſt and by South, and East and by North, and are diſtant 14 Leagues.

Cape-Cleer and *Silly*, lie East South-east, and Weſt North-weſt, diſtant 50 Leagues.

Two Leagues Weſt by South from *Cape-Cleer* lieth a high ſteep Rock alone in the Sea called *Faſtney*, which ſheweth at firſt ſight like a Sayl.

There lieth from *Faſtney* a Haven called *Crook-Haven*, and is from it North-Weſt, diſtant 4 Leagues.

There is a Haven called *Scoll-haven*, which lieth from *Faſtney*, North and by Weſt, diſtant 4 Leagues.

There is a Head-land half way betwixt the *Old-head* of *Kinſale*, and *Baltamore*, and it lieth North-weſt and by Weſt; from it is a good Haven called *Glendore*, there is a High-land to the Eaſtward, you muſt go aboard that High-land, and ſo into the Haven. There is a ranny of Rocks on the Weſt-land that goeth to the Eaſtwards: Therefore keep the Eaſt-ſide, and when you come in, anchor before the Caſtle: There lieth Weſt North-weſt from the ſaid Head, a good Haven called *Caſtle-Haven*, 4 Leagues from it; and if you come out into the Sea, and meet with the *Stags*, you muſt go North-eaſt into *Caſtle-haven*, and in the entry there is an Iſland, which you muſt leave on the Eaſt ſide of you, and another flat Iſland, which you muſt leave on the Weſt ſide of you; you may go dry at low water from it to the Main, for it is very nigh to the Weſt-land, but be bold on the Eaſtern Iſland, and go right with a Chappel that lieth on the Eaſt-ſide of the Main Land, and when you are thwart of the Chappel, you ſhall ſee a Caſtle on the Weſt ſide, and thwart of the Caſtle, you may enter in 12 fathom, it is from the *Stags* 3 Leagues and half.

You muſt underſtand that the Flood ſhoots from *Dorſeys* to the *Old-head* of *Kinſale* North North-eaſt, and the Ebb to the contrary, and from the *Old head* to the Tower of *Waterford*, North-eaſt and South-weſt, and from the *Dorſeys* to the Northwards, North North-eaſt and South South-weſt.

If you will go in betwixt the *Caſh*, and the *North-head* of the Grounds in *Dalkie*, you muſt bring a round Hill that ſtands like a Sugar-Loaf North North-eaſt, and you ſhall have 10 Fathom: it floweth South-eaſt along the Channel, and the Bar of *Poulbeg*. There is 8 foot Water upon it at low-water, and 2 Fathoms at full Sea; your Bar lieth

lieth South and North, and you ſhall have in the Road of *Poulbeg*, 14 Foot at low water.

To ſail from *Dalkie* to the Road of *Poulbeg*, you muſt keep a ſmall Rock open a Hand-ſpike length, and when you come to the Bar, you muſt lie West South-weſt up into the Road within the Beacon, then you muſt anchor in 4 Fathom at High-water, for there are 2 Hills on the South ſide, a high Hill, and a low round Hill, being them both in one, and then you are in the beſt of the Road. A South South-eaſt Moon makes a full Sea.

If you are bound for *Dublin*, and would avoid the Sands and Banks that lie along the East Coaſt of *Ireland*, run then ſo far to the Northwards, until you ſee the little Iſland (the *Ireland's* Eye) without the Point *Houth* or *Hedenhouth*, run then right on to *Houth* or *Hedenhouth*, and then you ſhall take no hurt of the North Grounds.

A Note for going into MILFORD.

TWo Leagues to the Weſtwards of St. *Gawens* Point, the South Point of *Wales*, lieth the Haven of *Milford*, a broad and wide Sound, lying at the entry in the North-eaſt; being come within the Points, you may go up to the Northwards, Eaſtwards, and Southwards unto divers Places and Roads. About by the North Point you may ſail into *Dale* Road, there is good lying in 3 Fathoms, and 3 Fathoms and a half at low-water. When you come a little within the South Point, in the open of *Milford* Haven, there lieth a little Iſland or Rock like the Mawſtone at *Plymouth*, being a little paſt that, you may run to the Southwards into the *Bay*, where you may lie Land-lockt for all Winds.

A little to the Weſtwards of *Milford* Haven lie two little Iſlands, the ſouthermoſt is the ſmalleſt, called *Stockholm*, and the Northermoſt *Scaline*, 2 Leagues Weſt and by South: From *Scaline* lieth the Iſland *Graſholm*, a round clean Rock; and about 4 Leagues off from it lie alſo 2 little Lands, called the *Smalls*, between them lieth a ledg of Rocks, and it is dangerous coming between them.

A General and Compendious TIDE-TABLE, *shewing what Moon makes Full Sea, or High-water, in all these Places following.*

On the Coasts of *Flanders, Holland, Friesland, Zealand, Jutland,* and *Norway.*	H.	M.
AT *Graveling, Dunkirk, Newport,* and all the Coasts of *Flanders,* S. and N.	12	00
Before the *Wielings, Flushing, Rammakins,* and *Brewers* Haven, and all the Coasts of *Zealand,* S. S. W. and N. N. E.	01	30
At *Roterdam, Harlem,* the *Maes,* upon the Flats of West-*Friesland, Wyering, Amsterdam, Dort,* and *Zeerick* Sea, N. E. and S. W.	03	00
In the *Breesand* and *Vourd,* underneath *Holy-Land,* and *Clefts* of the *Texel,* W. S. W. and E. N. E.	04	30
In the Road of *Texel,* E. by S. and W. by N.	06	45
At the *Jutlandish* Isles, before the Rivers of *Hever, Eyder,* and *Elve,* at *Horn, Enchuysen,* and *Vrk,* N. and S.	12	00
In the *Fly,* and *Ameland Gat,* before the Eastern and Western *Emes, Egmont,* and *Scolbalgh,* S. E. and N. W.	09	00
From the *Naze* of *Norway,* until past *Bergen,* to the Land of *Stade,* the Water riseth and falleth, but keeps no certain Tide.		
At the North Cape, and *Blanchrow,* S. W. and N. E.	03	00
Fox Nose, and St. *Nicholas* Road, W. S. W. and E. N. E.	04	30

On the Coasts of France, Spain *and* Portugal.	H.	M.
AT *Blackness, Army,* and *Camfar,* S. S. W. and N. N. E.	01	30
At *Bulleyn, Synehead,* in the *Fosi* of *Caen,* all the Coasts of *Normandy,* and *Picardy, Calice-Road,* and *Diepe,* S. S. E. and N. N. W.	01	30
Within the *Seyn,* before the *Casquets,* and before *Garnsey,* S. E. and N. W.	09	00
At *Barfleur, Sherbrough* and *Cape de Hague,* S. by E. and N. by W.	11	15
At *Concallo,* St. *Mallous,* without *Ushant, Morlaix,* St. *Paul's,* between *Briack* and 7 Isles, E. by N. and W. by S.	05	15
In the Race of *Fontnay,* S. W. by S. and N. E. by N.	02	15

At

	H.	M.
At *Breſt*, and before the River of *Burdeaux*, within the River of *Roan*, S.W. and N.E. by E.	03	45
At *Porthus* before the *Killiots*, the River of *Nants*, the Coaſts of *Britain*, *Poictu*, and *Gaſcoigne*. As alſo on all the Coaſts of *Biſcay*, *Galicia*, *Portugal*, and *Spain*, a South-Weſt and North-Eaſt Moon maketh High-water, and with in the Havens a Point later.	03	00

On the Coaſts of Scotland.

Betwixt *Tinmouth* and St. *Abbs-head*, at *Boeckneſs*, and *Orcaneſs*, N. E. and S. W.	03	00
In the *Frith*, S. W. by S. and N. E. by N.	02	45
In the Haven of *Leith*, S.W. by W.	03	45
At *Dundee*, and *Aberdeen* S.S. W.	01	30
At *Fair Iſles*, S. E. and N. W.	09	00
In St. *Magnes Sound*, S. E. by E.	08	15
In *Shotland*, in the *Havens* and *Sounds*, S. S. W. and N. N. E.	01	30

On the Coaſts of England.

At *Barwick*, it flows S. S. W.	01	30
At the *Staples*, and *Hown cliff-Foot* half-Tide, N. E. by E. and S. W. by W.	03	45
At *Tinmouth*, *Hartlepool*, the *Tees*, *Robin Hood*'s Bay, and *Scarborough*, S. W. and N. E.	03	00
At the *Spurn*, *Newcaſtle*, and *Humber*, W. by S. and E. by N.	05	15
At *Blackney*, *Wells*, *Bernum*, and *Lynn*, E. and W.	06	00
Before *Cromer*, *Winterton*, and Banks of *Yarmouth*, S.E. and N. W.	09	00
In *Yarmouth* and *Leyſtaff* Road, between *Leyſtaff* Road and *Orfordneſs*, S. E. by S. and N. W. by N.	09	45
Between *Orford*, and *Orwell* Waves, S. S. E. and N. N. W.	10	30
Before *Margate*, & *Thamesmouth*, S. by E. and N. by W.	11	15
Leigh, and *Kentiſh Knock*, *Spits*, and along the *Swin*, N. and S.	12	00
The Weſt end of the *Nore*, *Rocheſter*, and *Malden*, S. by W. and N. by E.	12	45
Harwich, *Dover*, North and South *Foreland*, and in the *Downs*, S. S. E. and N. N. W.	10	30
Betwixt *Dover* and *Dongineſs*, and thwart the *Neſs*, S.S. W. and N. N. E.	01	30
In the *Camber* of *Rye*, and *Gore-end*, S. by E. and N. by W.	11	15
At *Camberneſs*, and the *Needles*, S. E. by S. and N.W. by N.	09	45
Portſmouth, *Cows*, *Hampton*, and the Iſle of *Wight*,		

	H.	M.
South by East and North by West.	11	15
In the *Offing*, from North *Foreland* to the South *Foreland*, it runneth half-Tide; from the South *Foreland* to the *Ness*, it runneth half-Tide, and half-quarter-Tide; from the *Ness* to *Fairly*, one half-Tide; from *Fairly* to *Beachy*, one quarter Tide under other.		
At *Portland* Road, E.S.E. and W.N.W.	07	30
At St. *Hellens*, S.E. by E. and N.W. by W.	08	15
Within the *Race* of *Portland*, at *Pool*, *Homehead*, thwart of *Plimouth* and *Dartmouth*, S.E. and N.W.	09	00
At *Waymouth*, E. and W.	00	00
At *Falmouth*, *Foy*, *Plimouth* and *Dartmouth*, W. by S. and E. by N.	05	15
At the *Start*, *Briſtol*, and *Foulneſs*, E. by S. and W. by N.	06	45
Mouſhole, W.S.W. and E.N.E.	04	30
St. *David's head*, E. & W.	06	00
Milford Haven, E.S.E. and W.N.W.	07	30
Iſle of *Man*, and *Caſnes*, S.E. and N.W.	09	00
Three Leagues off the ſhore, at the *Lizard*, at the ſhore to the *Landsend*, E.S.E. and W.N.W.	07	30
Within *Torbay*, and in the Bay of *Caernarvon*, W. by S. and E. by N.	05	15

	H.	M.
At the Mouth of *Severn*, *Moonleſs*, from the *Lizard* to the *Sorlings*, W. by S. and E. by N.	05	15
Before *Silly*, in the Channel, E. and W.	06	00
At *Silly* half-Tide, S.S.W. and N.N.E.	01	30
Within *Mounts* Bay, and in the Sea of *Wales* and *Severn*, W.S.W. and E.N.E.	04	30
At *Lundey*, and the *Holmes* of *Briſtol*, E. and W.	06	00
In the *Sleeve*, between *Silly* and *Uſhant*, S. and N.	12	00
Note, That the Flood ſets not in at the Eaſt end of the *Wight*, till a South-Eaſt Moon, in the Road of *Dungeneſs*, South South-Eaſt; but without in the Channel, a South-Weſt Moon makes full Sea: From the *Seames*, and in the broad Sound, between it and *Uſhant*, the Flood runneth Eaſt North-Eaſt, and Weſt South-Weſt.		

On the Coaſts of Ireland.

AT *Caldy*, W. by S. and E. by N.	05	15
Waterford and *Abermorick*, E. and W.	06	00
Cape Cleer, E.S.E. and W.N.W.	06	30
Machnel's Caſtle, *Dublin* and *Lambay*, S.E. by E. and N.W. by W.	00	15
In the *Fair-way*, betwixt		

	H.	M.
Silly and *Ireland*, S. W. by W. and N. E. by E.	03	45
At *Kildney*, S. E. & N. W.	09	00
On the West-Coast of *Ireland*, N. E. and S. W.	03	00

	H.	M.
Dungarvan, *Kinſale*, *Corkhaven*, *Baltimore*, and all the Havens on the South-Coaſt of *Ireland*, E. by N. and W. by S.	05	15

The Courſe of all the Coaſts of Holland, Zealand, France, *and* Spain, *upon what Point, and what diſtance they are.*

From the Iſle of *Texel* to *Egmont*, S. by W. Leagues 5
From *Egmont* to the *Maze*, S. S. W. 11
From the *Maze* to the *Wieling*, S. W. 12
From the *Wielings* to the Head or Strait between *Dover* and *Calice*, W. S. W. 18
From the Iſle of *Walkeren* or *Fluſhing* to *Calice*, S. W. by W. 22
From *Blackneſs* to *Deep*, S. S. W. 21
From *Deep* to *Seyn-head*, or the River of *Seyn*, W. S. W. 15
From the *Seyn-head* to the River of *Caen*, S. W. 8
From thence to Cape *de la Hague*, N. W. 21
From Cape de *Hague* to the *Caskets*, W. by N. 11
From the *Caskets* to *Garnſey*, S. W. by W. 6
From *Garnſey* to St. *Malo*, S. S. E. 16
From *Garnſey* to the ſeven Iſles, S. W. by S. 14
From the ſeven Iſles to St. *Paul*, W. S. W. 10
From the Iſle of *Baſs* to the *Fourn*, W. S. W. 16
From the *Fourn* to St. *Matthew's* Point, S. S. E. 5
From thence to *Fontnay* or *Founteyns*, S. by E. 7
From *Uſhant* to the *Seams* a Sea board it, S. 7
From *Fontay* to the weſt *Penmarques*, S. E. 9
From the weſt *Penns* to the eaſt *Penns*, E. S. E. 6
From the eaſt *Penns* to the Iſle of *Groye*, E. by S. 10
From the weſt *Penmarques* to *Bell-Iſle*, E. S. E. 21
From *Bell-Iſle* to *Uſe* ſomewhat more eaſterly, S. E. 16
From *Bell-Iſle* until within *Piquilier*, E. and S. 12
From *Bell-Iſle* to *Croyſil*, E. by S. 9
From *Piquilier* to *Uſe*, S. by W. 7
From *Uſe* to the *Killicts*, E. S. E. 10
From the Iſle of *Uſe* to *Portluis*, S. E. by E. 12

From St. *Martin's* Island to the *Burning-Isle*, S. by E. —— 3
From the *Burning-Isle* to the *Oyster-Bank*, S. S. E. —— 3
From St. *Martin's-Isle* to the Tower of *Cardan*, S. by E. —— 16
From the Tower of *Cardan* to *Bayone*, S. & N. —— 28
From *Bayone* to St. *Sebastian*, W. S. W. —— 12
From St. *Sebastian* to Cape *Martincacho*, W. N. W. —— 13
From Cape *Martinchaco* to *Bilboa*, S. W. by S. —— 6
From *Bilboa* to St. *Anthony*, W. by N. —— 10
From St. *Anthony* to St. *Andero*, W. by S. —— 7
From St. *Andero* to Cape *de Pinas*, E. & W. —— 32
From Cape *de Pinas* to *Ortegal*, W. by N. —— 29
From Cape *de Pinas* to *Ribadeo*, E. —— 14
From *Ortegal* to the Isle of *Cizarga*, S. by W. —— 19
From *Cizarga* to *Coronna*, E. S. E. —— 7
From *Cizarga* to Cape *Coriana*, W. S. W. —— 15
From *Coriana* to Cape *Finisterre*, S. & N. —— 3
From *Finisterre* to *Bayone*, S. E. by S. —— 20
From *Bayone* to *Port de Port*, S. S. E. —— 24
From *Port de Port* to *Aviero*, S. & N. —— 10
From *Aviero* to *Montega*, S. S. W. —— 7
From *Montega* to the *Barlings*, S. W. —— 13
From the *Barlings* to *Roxende*, S. by E. —— 16
From *Roxende* to St. *Uves Point*, S. E. by S. —— 10
From St. *Uves Point* to the *Cape* of St. *Vincent*, S. & N. —— 29
From Cape St. *Vincent* to *Pharo*, E. & W. —— 19
From *Pharo* to *Lepe*, N. E. by E. —— 17
From *Pharo* to *Saltees*, E. N. E. —— 24
From *Saltees* to *Chipiona*, S. E. —— 9
From *Chipiona* to *Cales*, S. E. —— 9
From *Cales* to the Strait of *Gibralter*, S. E. —— 11
From *Cales* to *Cape de Cantin*, S. W. by S. —— 95
From *Cape de Cantin* to the Isle of *Madera*, W. —— 130
From St. *Vincent* to *Madera*, S. W. by W. —— 155
From *Roxende* to *Madera*, S. W. —— 169
From *Roxende* to the Isle of *Tercera*, W. —— 270

The Courses of England, Scotland, *and* Ireland.

From *Cattneſs* to *Boeckneſs*, S. E. by S. —— 22
From *Boeckneſs* to *Leith* in *Scotland*, S. S. W. —— 34
From *Leith* to *Barwick*, S. S. E. —— 12

From

From *Barwick* to *Holy-Isle*, E. S. E. —— 4
From the *Staples* to *Cocket-Island*, S. by E. —— 9
From *Cocket-Isle* to the *Tees-mouth*, S. S. E. —— 18
From the River of *Tees* to *Flamborough-head*, S. E. by E. —— 17
From *Flamborough-head* to *Blackney*, S. E. —— 18
From *Blackney* to *Winterton*, S. by E. —— 9
From *Winterton* to *Leistaff*, S. by E. —— 5
From *Leistaff* to *Orford-haven*, S. —— 8
From *Orford* to the *Foreland*, S. by E. —— 15
From the *Foreland* to *Dover*, S. —— 5
From *Dover* to the *Shingles* or *Ness Point*, S. W. by W. —— 7
From the *Ness Point* to *Beachy*, W. S. W. —— 6
From *Beachy* to the Isle of *Wight*, W. by S. —— 15
From *Wight* to *Portland*, W. by S. —— 10
From *Portland* to the *Start Point*, S. W. —— 14
From the *Start* to *Ram-head Point*, W. N. W. —— 7
From *Ram-head* to *Dodmans Point*, W. S. W. —— 8
From *Dodmans* to the *Lizard Point*, S. W. by W. —— 6
From the *Lizard* to the Isles of *Silly*, W. —— 12
From the *Lizard* to the *Land's-end*, W. N. W. —— 8
From the *Land's-end* to the Isle of *Lundy*, N. E. —— 16
From thence to the *Holms* of *Bristol*, N. E. by E. —— 19
From thence to the Isle of *Caldy*, W. S. W. —— 25
From the Isle of *Caldy* to the *Saltees* on the Coasts of *Ireland*, W. N. W. —— 22
From *Saltees* to *Cape-Cleer*, W. S. W. —— 35
From *Cape-Cleer* to the Isle of *Dorsey*, W. —— 12
From the Point of *Dorsey* to the Isle of *Blakem*, N. N. W. —— 16
From *Blakem* to the Isles of *Arran*, N. N. E. —— 14
From the Isles of *Arran* to *Galwick*, or the *Gulf* in *Ireland*, E. N. E. —— 6

Of divers and sundry Courses over the Western-Sea.

From the *Texel* to *Flamborough-head*, W. N. W. —— 60
From *Texel* to *Winterton* in *Norfolk*, W. —— 48
From the Isle of *Texel* to *Leistaff*, W. by S. —— 35
From the River of *Maze* in South-*Holland* to *Harwich*, W. —— 34
From the said *Maze* to the *Foreland* of *England*, W. by S. —— 31
From the *Marsdeep* in North-*Holland* to the said *Foreland*, S. W. —— 36
From the said *Marsdeep* to *Calice*, W. by S. —— 52

From

From *Dover* to *Bulloign*, S. E. —— 9
From *Bulloign* to *Beachy*, W. —— 20
From *Beachy* to *Deep* in *Normandy*, S. E. —— 18
From *Deep* to the Isle of *Wight*, E. S. E. —— 32
From *Wight* to the *Seyn-head* or *Mouth*, S. E. —— 27
From the said River of *Seyn* to the *Foreland*, W. N. W. —— 36
From the Isle of *Wight* to the *Caskets*, S. W. by S. —— 19
From *Garnsey* to St. *Malo* in *Normandy*, S. S. E. —— 18
From the *Caskets* to *Portland*, N. by W. —— 17
From the *Caskets* to the *Start Point*, W. N. W. —— 22
From the *Start* to the *Sept Isles* in *Normandy*, S. S. E. —— 31
From the *Start* to St. *Paul* in *Normandy*, S. by W. —— 28
From St. *Paul* to *Portland*, N. E. by N. —— 39
From the *Fournes* to *Rambead*, N. N. E. —— 38
From the *Start Point* to *Ushant*, S. W. by S. —— 44
From the *Fournes* to the *Lizard*, S. & N. —— 30
From *Ushant* to the Isles of *Silly*, N. N. W. —— 36
From the *Sorlings* to *Milford haven*, N. by E. —— 40
From the *Sorlings* to *Wexford* in *Ireland*, N. N. W. —— 44
From the *Sorlings* to *Cape Cleer*, N. W. —— 45
From *Cape Cleer* to *Cape-Finisterre*, S. & N. —— 180
From the *Lizard* to the *Cape de Finisterre* in *Galicia*, S. S. W. —— 112
From *Ushant* to the Isle of *Crizarga* in *Galicia*, S. S. W. —— 110
From *Ushant* to *Laredo* in *Biskay*, S. S. E. —— 105
From the *Seam* Rocks to St. *Sebastian* in *Biskay*, S. E. by S. —— 115
From *Ushant* to Cape de *Pinas* in *Biskay*, S. & N. —— 95
From *Bell-Isle* to *Ortegal* in *Galicia*, S. W. —— 90
From St. *Martin's* Isle to *Ortegal*, W. S. W. —— 96
From *Ortegal* to Cape *de Corina*, S. W. by W. —— 33
From Cape *de Finisterre* to the Isle of St. *Michael*, W. S. W. —— 230
From *Madera* to the great Isle of *Canary*, S. E. by E. —— 85
From Cape *de Finisterre* to *Bayone* in *Galicia*, S. by E. —— 20
From Cape *de Finisterre* to the Isle of *Barlings*, S. & N. —— 67
From the *Barlings* in *Portugal* to the Isle of *Canary*, S. S. W. —— 220
From Cape *de* St. *Vincent* to Cape *de Cantin*, S. —— 86
From Cape St. *Vincent* to Cape *de Geere*, S. by W. —— 133

The Courses of Norway, Sweedland, *and* East-Finland.

From the *Fly* to the *Naze* of *Norway*, N. by E. —— 85
From the *Naze* to *Schuyteness*, N. by W. Westerly —— 261

From

From the *Naze* to *Fleckery*, E. N. E. ——— 9
From *Fleckery* to *Longsound*, N. E. ——— 19
From *Longsound* to the *Scawe*, S. E. by S. ——— 21
From the *Scawe* to *Nyding*, E. by S. ——— 16
From *Nyding* to *Waesbergen*, S. E. ——— 5
From *Waesbergen* to *Coll*, S. by E. ——— 12
From *Coll* to *Elsenore*, S. E. by S. ——— 5
From the *Buoy* on *Drakers-Riff* to the *Buoy* on *Falsterborn's-Riff*, S. 5
From *Falsterbourn* to the Northward of *Bornholm*, E. by S. ——— 20
From *Bornholm* to *Houburg*, the South end of *Gotland*, N. E. ——— 50
From the *Karels* to the Channel of *Stockholm*, N. by W. ——— 31
From the North-end of *Bornholm* to *Rosehead*, E. by S. ——— 40
From *Rosehead* to *Coningsberg*, E. by S. ——— 17
From the *Rosehead* to *Der Winda*, N. E. by E. ——— 57
From *Der Winda* to *Dageroort*, N. by W. ——— 33

The Depths and Soundings near divers Provinces: and first of Gascoin, Poictu, *and* Britain.

WIthout the River of *Bourdeaux* there is 14 Fathom depth, but when you come within the sight of *Cordam* Tower, 20 Fathom.

Over against the Coasts of *Poictu*, 16 Leagues without *Oleron*, you have 35 Fathom; coming near the Land 8 Leagues from the Shore, you have 35 Fathom: in the Channel between *Porthuis* and *Use*, it is 30 Fathom, and as much in the Channel of *Use*; as also between *Use* and *Bell-Isle*, without the Channel is 35 Fathom, but within 25. Without *Use* two Kennings off, there is found 45 Fathom.

Twenty two Leagues Southward off *Bell-Isle*, is 70 Fathom, but 9 Leagues from the North-west Point of that Island, towards the South-west is 60 Fathom; and over against the midst of *Bell-Isle* in 40 Fathom deep, you shall see Land. In your Course between *Bell-Isle* and the *Seams*, you shall come no nearer than 50 or 45 Fathom, if you sail from *Bell-Isle* West and by North: when you are against *Gloyland*, you shall find 60 Fathom depth without, and within the Rock which stands off *Gloyland* to the Sea-wards you have 40 Fathom water: In 60 Fathom depth without the west *Penmarks*, you may sail North-west by West without the *Seams*, but by Night come no nearer than in 55

Fathom, for the Ground is groſs and red Sand, and full of red Flints; half a League Weſt South-weſt of the *Seams* is a ledg of Rocks, where you have 17 Fathom depth, but between the *Seams* and the Rock is 50 Fathom.

In the Channel between the *Seams* and *Uſhant*, is 55 Fathom depth, the Ground is groſs and red Sand, with little round Stones red and black: near to *Uſhant* is 45 Fathom, but within it is of a variable depth: South-weſt almoſt 6 Leagues off *Uſhant* you have 70 Fathom, and the Ground is fine white Sand, with little white Shells, and other ſmall things like Needles, and then is *Uſhant* Eaſt from you; but if the Sand be groſs and white, mingled with great and white Shells, then it is South-eaſt to you; but if you doubt of theſe Grounds, go northerly if your Sound be deeper, then you are towards the *Seams*, but if not ſo deep, then you are in the Channel almoſt North of *Uſhant*.

Between *Uſhant* and *Obverack*, in the Trade, it is 60 Fathom depth, between *Uſhant* and the *Sorlings* in the midſt of the Channel there is 70 Fathom, between the *Seams* and *Uſhant* is 70 Fathom water, the Ground is of little black Stones eaſy to be broken, and of yellow Earth and Clay; but if you find red and hard Sand, go Northward till you happen on white Sand mingled with long Stroaks, and then you are in the Channel.

If from *Cizarga* you ſail North North-eaſt in the *Spaniſh* Seas towards *Uſhant*, and find your ſelf in 80 Fathom, you are 14 or 15 Leagues off *Uſhant*; but coming nearer you ſhall have 70 Fathom water, and be 10 Leagues from *Uſhant*; but if you find the Ground to be yellow Shells, and little black Stones, then you are towards the *Seams*, therefore you muſt with the Tide bear off Northward to ſhun *Uſhant*, until you find white Sand, and things like needles, for ſuch are the Grounds of the Channel.

Betwixt *Uſhant* and the Iſle of *Baſe*, when you ſail at 4 Fathom water, you are 4 Leagues off the ſhore, but by night come no nearer than 25 Fathom. When you are 2 Leagues off *Obverack*, you ſhall find 25 Fathom depth, but 8 Leagues off the *Sept* Iſles you have 55 Fathom.

A League without the Rocks of *Obverack* there is a blind or hidden Rock; ſo that if you were to ſail upon a board between the *Fournes* and *Obverack*, come no nearer the blind Rock than 40 Fathom, but Eaſtward you may ſail in 30 or 25 Fathom.

If a Ship ſailing Weſt South-weſt, and South-weſt by Weſt off *Silly* at 80 Fathom water, be found to be under 49 Degrees 15 Minutes of Altitude, ſhe is 26 Leagues from Land, and muſt go Eaſt and by North, until

until she get 66 Fathom Water, for then she is in the Channel between *Silly* and *Ushant*; and then if she be bound for *England*, she must sail more Northward, and between the Land's-end and the *Lizard* she shall have 55 Fathom depth.

The Soundings and Grounds between Ireland, England, *and* Normandy.

THree Leagues without the Isles of *Dorsey* near *Ireland*, it is 45 Fathom deep: In the Channel between *Dorsey* and *Cape-Clear*, is 42 or 43 Fathom, the Channel from *Cape-Cleer* to *Saltees* hath 45 Fathom, but two Leagues off *Ireland* it hath but 40; between *Saltees* and *Milford* it is 44 Fathom deep, and between *Lundy* and *Silly* is 38 Fathom: In the Mid-way between *Silly* and *Milford* is 44 Fathom, but North of *Silly* 40 and 42, and near *England*, by the Land's-end, the Channel is 50 Fathom deep.

Coming from Cape *Finisterre*, sailing North North-east, if you have 80 Fathom you are 20 Leagues off the Shore, and the Ground is small black Stones with great red Sand: In the same Course, when you have but 60 Fathom you are within 12 or 14 Leagues of the Shore, but shall not so soon ken Land as you think for; you shall a great while have 60 Fathom, being at the North parts of the Channel about *Silly*: Between *Ushant* and *Silly*, the Channel is 70 Fathom, on the South-side of *Silly* the Ground is small red Stones and fine white Sand: Over against the *Lizard* and *Falmouth* 4 Leagues from the Shore, is 52 Fathom: Betwixt *Foy* and *Plymouth* Sound, in the Channel nighest is 60 Fathom; between the *Lizard* and the *Start*, bear no nearer the Shore than 35 Fathom; you may cast Anchor in the Trade or Channel in 25 Fathom, and so you shall lie within the *Foreland* Stream; between *Plimouth* and the *Sept* Isles, in the midst of the Channel 55 Fathom, but four Leagues South South-West of *Plimouth*, is but 35 Fathom; South South-east off the Mid-land of the *Start* is 46 Fathom; but from thence 5 or 6 Leagues South east is 54 Fathom: In the Channel between the *Caskets* and *Portland* is 40 Fathom; And a League North off the Isle of *Alderney*, is a Hole or Pit 80 Fathom deep, all the rest of the Channel between *Portland* and *Alderney* is of equal depth, *viz.* 40 Fathom; When you are within kenning of *Portland*, your Sounding is 34 Fathom; and 2 Leagues off *Wight* 36 Fathom; also 2 Leagues Eastward of *Beachy*, between *Picardy* and *Wight*, the Channel in the midst is 38 Fathom: between *Winchelsey* and *Picardy* is 24 Fathom, the Shoals between the

Heads called the *Vronwensand* or *Ripraps*, hath but 3 Fathom and an half; but on the South-side of it is 24 Fathom; and in all the fair way between *Zealand* and *Dover*, it is 24 Fathom deep.

The depth of the North Sea from the Foreland.

IN the Channel from *England*, *Foreland*, and the Sands of *Flanders*, you have 24 Fathom deep, but 3 Leagues North-west by West, off the County of *Zierickzee*, called *Bobreck*, it hath but 4 Fathom deep without the Shoal; the Channel of *Zealand* is 26 Fathom, North-west off *Harlem* 8 or 9 Miles within the Sea, there beginneth a Shelf called the *Broad Fourteens*, reaching along the Coast of *Holland* to the Plain of *Ameland*, where it endeth: Over against *Harlem* and *Egmont* is 13, 14, or 15 Fathom, and the Ground is full of Oase, mingled with black Sand like Mustard-Seed: The said Shelf hath 15 or 17 Fathom depth: Between *Texel* and *Vlyland*, where the Ground is gross red Sand, 6 or 7 Leagues from the Shore, so there the Shoal is narrower than it is toward the South end of the Channel: Without the Shoal between *Zealand* and *Texel* is 26 Fathom deep, as far as the Shoal which the Fishers call *Dog Sand*. In the Channel on *England* side over against *Yarmouth* is 35 Fathom, but against *Flamborough* and *Scarborough* Point 38 Fathom, whereas the white Shelf called *Dog-sand* beginneth, reaching into the North Seas to the Channel of *Holyland*; this Shoal (where it is within kenning of *Flamborough* Point) hath but 9 or 10 Fathom; but when in the same Sand you find 12 Fathom, then the *Texel* is from you South-east almost 30 Leagues; but when you come to 16 Fathom, then are you within 21 Leagues South South-east of *Vlyland*.

A Ship that comes from the *Riff*, finding 18 Fathom depth on the aforesaid Sand, is then 20 Leagues South and by East of *Vlyland*, but at 22 Fathom you must then sail towards the *Vlye* South and by West, and South South-west; but if in this Channel of *Holyland* 14 or 16 Fathom be found, then you must sail South-west, and South-west by South, and then you come to the *Schelling*; but if in *Holyland* Sound you have 27 Fathom, then are you altogether to the Eastward of it: between the *Riff* and the *Doggersand* the Channel is 26 Fathom; without the Channel Westward, it is 32 Fathom deep.

A Ship that comes out of the *English Straits*, or out of *Zealand* having at the *Riff* 24 Fathom, is from the *Naes* in *Norway* 18 Leagues North and by East; but having 20 Fathom, is but 16 Leagues from it North; and finding but 18 Fathom, is then 18 Leagues off it North and by West: the Course from thence to the *Helmer* is 12 Leagues North and

by

by East; from thence to the Point of *Scagens*, is 18 Leagues North-east by East: there is a Rock of 1 Fathom depth North-east, and North-east by East off the *Holmes* two Leagues from Shore.

Depth near Jutland *and* Ameland.

IN the Sea near *Jutland*, a Mile from *Dodenberg*, is a Bank called *Reifborn*, stretching out 8 Leagues West and by South, in some Places but 3 Fathom depth, and in some Places may be sailed over and become a Road for a North-west, and a North Wind in 20 Fathom: From *Ameland* towards the Sea the Ground is gross Sand, red and black mingled with Shells; thence Southward in 16 Fathom, sailing 3 Hours, you shall come to the smooth Sea of *Ameland*, where the Ground is fine Sand with Shells: North from *Schelling* in 24 Fathom is fine white Sand, and in 8 Fathom white and black Sand mingled; *Vlyland* hath white Sand with Shells and thin black Sand in 16 Fathom depth: from the West-end of *Vlyland* is great red Sand mingled with black like unto Mustard-seed; about 6 or 7 Leagues from Shore at the East-end of *Schelling*, to Sea-wards, at 18 Fathom is fine white Sand mingled with black, having in it things like Needles. Over against *Bork* in the Western *Emes* at 17 or 18 Fathom deep, Land may be seen; the Ground gross gravelly Sand. At 14 Fathom may *Ameland* be kenn'd, but *Schelling* at 16, and *Vlyland* at 15 or 16 Fathom water. At the North *Hook* of *Texel* Land may be seen at 16 Fathom, *Holland* at 14 or 15. When you sail within the Shoal called the *Broad Fourteens*, which beginneth North-west of *Harlem*; and stretched along the Coast of *Holland*, to the West-end of *Vlyland*, it is 7 or 8 Leagues from the Shore.

Soundings and Grounds near the Schaw.

A Great League West and by North from the *Schaw*, is 35 Fathom deep: North North-east a great League off the Corner of this Point, is 38 Fathom, and when the Point is North-east from you, then you have 17 Fathom. Between this Point and *Leson*, the Channel is 20 Fathom deep, and the Ground like Clay or Dirt; between *Anhout* and *Waersberg*, in the midst of the Channel is 22 Fathom water: Between *Leson* and *Anhout*, the Ground is fine and stony; near *Waersberg* to a Shoal of 17 Fathom deep: Between *Anhout* and *Coll* is another Shoal of 17 Fathom, where sometimes it is troublesome like a Whirlpool.

Depths

Depths of the Eaſtern *Seas.*

BEtween *Oeland* and *Gothland*, the Soundings are unequal; ſometimes of 20, ſometimes of 23 Fathom, the Ground groſs, and black ſtony Sand like Peaſe: When the South-end of *Oeland* is 2 Leagues from you Weſtwards, you have 27 Fathom, where alſo you may gage Water; but when the Chappel of *Sudernoorden* beareth Weſt North-weſt off you, then have you 31 Fathom, and ground fit to gage Water. Over againſt the Rock in the fair Way is 52 Fathom, and a Clay Ground, but fit for Gaging: between the greater and leſſer *Carta* is 14 Fathom, under which is a ſafe Road for Ships; there is a Shoal between *Houghberg* and *Oſtergard*, 24 Fathom depth, the Ground great Sand, but hardly from thence can you ken *Gothland* out of the Top; there is alſo to the Eaſtward another Shoal of 36 Fathom, which when you are paſt, you have more than 40 Fathom water: When the Point of *Right* is 3 Leagues South-eaſt from you, then have you 30 Fathom; but when it is from you half a League South South-eaſt, you have but 15 Fathom, and the Ground is white Sand; but when it beareth Weſt a ſmall League from you, then you ſhall find 16 Fathom: over againſt *Heel*, half a League from the Shore, it is almoſt 3 Fathom deep; the Road for Ships at *Heel* hath 25 Fathom depth: Between *Moan* and *Falſtenbourn* is 14 Fathom depth: Between *Stead* and *Falſtenbourn* in the very Channel, is but 12 Fathom deep: Near *Falſtenbourn* it is full of Shoals, but near *Stead* you have 13 Fathom water; between *Darkriff* and *Southiomen*, which is more ſhoally, there is 5 Fathom wanting two Foot, from thence toward the Sound it is ſomething deeper than 6, 7, 8, 9, or 10 Fathom.

A Note of certain and moſt dangerous Places in the Sea.

THe principalleſt and moſt perilous of all, is the *Mael-ſtream Well* or *Slorp*, called the *Mouſk-ſtream:* which lieth on the back-ſide of *Norway* in 68 Degrees, on the North-ſide of an Iſland or Rock called *Weeray*. This Well draweth the Water unto it ſelf, during the whole Flood, (which is the ſpace of 6 Hours 12 Minutes) with ſuch an indraught and force, and with ſuch a noiſe, through the tumbling and falling of the Waves & Streams one upon the other, that it is rather to wonder at than to write of. So that during that time, within the ſpace of more than 2 Leagues round about the Rock of *Mouſk* (under which that Water floweth) no Ship or other Veſſel may come near, for they ſhould to their utter deſtruction be drawn into it, and ſwallowed up; but

but all the time of the Ebb the Water is ſo ſtrongly caſt up again, that no kind of Subſtance or Metal, how heavy ſoever it be, can there ſink: So that our Northern Fiſhers at that time with their Jollen or Fiſhing Boats take many and Strange formed Fiſhes, which they draw into their Boats with Hooks and Lines, which they have ready laid for that purpoſe; for that during the Ebb, they cannot return into the Gulph, nor get under Water by any means.

The Northern People that inhabit about thoſe Rocks, do think that Stream paſſeth away underneath a part of *Norway*, under the North-bottom in East-*Finland*, becauſe that in that Place there is likewiſe ſuch a *Maal-ſtream*, (though not altogether ſo ſtrong nor dangerous) where the like Fiſhes are taken, and the water in like ſort troubleſom, as it is underneath and above the Rock of *Monsk*.

Whereupon many experienced Pilots do call the ſaid *Slorp*, *the Navel of the Sea*, which cauſes the Courſes of the Ebbs and Floods about all the Lands that are on the North-ſide of the Equinoctial, as the moſt convenient Place for that purpoſe, to ſpread the waters South, North, East, and Weſt; that is to ſay Northerly, toward the Pole-Artick, South Eaſterly on the back ſide of *Ruſſia* and *Tartaria*, and toward the Strait of the great South-Sea, called *Mar del Zur*, wherein the Spirits of Iſlands (called *Mollucca*'s) near the Equinoctial are lying Southward the North-Sea of theſe low Countries: As alſo on the back-ſide of *Scotland* and *Ireland*, towards the *Spaniſh* and *Atlantick* Seas, and towards the North-weſt beyond *Iſland*, towards *Frobiſhers Straits*, where it is thought the way unto *Cataya* may be found.

There are moreover to be feared in the Weſtern Seas, very dangerous Streams and Gulphs, as in the Race of *Portland*, where oftentimes happeneth ſuch turning and tumbling of Waves and Streams, that the Ships which paſs that way are many times in great Peril.

Moreover, the Race of *Blanquert*, between *Normandy* and the Iſles of *Alderney*, roareth and rageth, and ſo dangerouſly, that many Ships fall therein head-long, ſo deep, that ſuddenly they are ſwallowed up, and ſunk to the very Bottom.

The Race of *Fountney*, is more dangerous than all theſe, wherein many ſmall Veſſels and Barques of *Britany*, and of other Countries, are ſuddenly devoured and caſt away: And the entrance of the *Garronne*, called the River of *Bourdeaux*, between the Towers of *Cordum*, and the Southern and Northern *Aſſes*, is likewiſe very perilous, and many Ships do often periſh there, if the Pilots be not skilful and well acquainted with the Place.

And

And therefore being the most full of danger, it behoveth each Pilot or Master, to have especial knowledg therof, and great care to prevent the danger that may ensue unto them thereby.

A Brief Explication of the several parts of this following Kalendar or Ephemerides.

THe first Page contains an *Almanack* for 24 Years to come, shewing the Prime, Epact, Sunday-Letter, Leap-year, and all the principal moveable Feasts.

The following Leaves shew the 12 Months of the Year in their order, and each Month is divided into several Columns or Spaces, which are alike on all the Months.

In the first is set down the Prime.

In the second is set down the Hour and Minute of the New-Moon, for 19 Years following.

In the third, the Day of the Month.

In the fourth the Sunday-Letter, whereby you may know the Day of the Week.

In the fifth is set down the Names of the fixed Feasts, and other Days of Note, and in the void place between them is set down the time of the Sun-rising and Setting at *London*.

Then followeth four Sections, each one consisting of three Columns, where is set down the Longitude and Declination of the Sun in the Meridian of *London*, for the Years 1692, 1696, 1700, 1704.

Unto this *Kalendar* is added the *Gregorian* or Foreign Account for every Month.

Hereafter

Hereafter followeth a moſt excellent, neceſſary, and compendious Kalendar, *ſhewing the* Prime, Epact, Dominical-Letter, Leap-Year, *and* Moveable Feaſts *for* 16 *Years, incluſively comprehending therewith the true Day and Hour of the Moons* Conjunction *or* Change *for* 16 *Years to come, with the true place of the* Sun, *and his* Declination *from the* Equinoctial, *both Northwards and Southwards upon every* Degree *thereof through the Twelve Months of the Year.*

The Engliſh Account.								Foreign Account.			
Years of our Lord.	Prime.	Epact.	Sunday Letter.		First Sunday in Lent.	Eaſter Day.	Whit-Sunday.	Eaſter Day.	Whit-Sunday.	Sunday Letter.	
1696	6	6	E	D	Mar. 1	Apr. 12	May 31	Apr. 22	June 10	A	G
1697	7	17	C		Feb. 21	4	23	7	May 26	F	
1698	8	28	B		Mar. 13	24	June 12	Mar. 30	18	E	
1699	9	9	A		Feb. 26	9	May 28	Apr. 19	June 7	D	
1700	10	20	G	F	17	Mar. 31	19	10	May 29	C	B
1701	11	1	E		Mar. 9	Apr. 20	June 18	Mar. 26	14	A	
1702	12	12	D		Feb. 22	5	May 24	Apr. 15	June 3	G	
1703	13	23	C		14	Mar. 28	16	Mar. 31	May 19	F	
1704	14	4	B	A	Mar. 5	Apr. 16	June 4	Apr. 19	June 7	E	D
1705	15	15	G		Feb. 25	8	May 27	11	May 30	C	
1706	16	16	F		11	Mar. 24	12	3	22	B	
1707	17	7	E		Mar. 3	Apr. 13	June 1	Apr. 16	June 4	A	
1078	18	18	D	C	Feb. 21	4	May 23	7	May 26	G	E
1709	19	29	B		Mar. 13	24	June 12	Mar. 30	18	E	
1710	1	11	A		Feb. 26	Apr. 9	May 28	Apr. 12	31	D	

January hath XXXI Days.

The Prime.	The time of the New Moon.		Month Day.	Week Day.	The English Kalendar.		*Leap Year.* ☉ in Capricorn			Diff. of Decli.	*First Year.* ☉ in Capricorn.		
					Suns rising	Suns setting	1696.	Suns Place.	Suns Decli.		1697.	Suns Place.	Suns Decli.
	H.	*M.*			*H. M.*	*H. M.*		*D. M.*	*D. M.*			*D. M.*	*D. M.*
			1	*A*	N. years day.		1	21 17	21 48	10	1	22 02	21 41
08	00	47	2	*B*	7 59	4 01	2	22 19	21 38		2	23 03	21 31
16	07	55	3	*C*	7 58	4 02	3	23 20	21 28	11	3	24 04	21 21
05	15	05	4	*D*	7 57	4 03	4	24 21	21 18		4	25 05	21 10
			5	*E*	7 56	4 04	5	25 22	21 07	12	5	26 07	21 59
	05	34	6	*F*	Twelfth day.		6	26 23	20 55		6	27 08	20 47
02	21	52	7	*G*	7 53	4 07	7	27 24	20 44	12	7	28 09	20 35
			8	*A*	7 52	4 08	8	28 25	20 32		8	29 10	20 23
10	16	26	9	*B*	Sun in Aqua.		9	29 26	20 19	13	9	♒ 11	20 10
18	22	10	10	*C*	7 49	4 11	10	♒ 27	20 06		10	01 12	20 56
			11	*D*	7 48	4 12	11	01 28	19 53	14	11	02 13	19 43
07	18	19	12	*E*	7 46	4 14	12	02 29	19 39		12	04 14	19 29
15	11	59	13	*F*	Hillary	4 16	13	03 30	19 45	15	13	05 15	19 15
			14	*G*	7 43	4 17	14	04 31	19 11		14	06 16	19 00
04	01	14	15	*A*	7 41	4 19	15	05 33	18 56	15	15	07 17	18 45
			16	*B*	7 40	4 20	16	06 34	18 41		16	08 18	18 30
	03	10	17	*C*	7 39	4 21	17	07 35	18 25	16	17	09 19	18 14
01	22	08	18	*D*	7 37	4 23	18	08 35	18 10		18	10 20	18 58
			19	*E*	7 35	4 25	19	09 36	17 54	17	19	11 21	17 42
09	15	59	20	*F*	7 34	4 26	20	10 37	17 37		20	12 22	17 25
17	23	20	21	*G*	Agnes	4 28	21	11 38	17 20	18	21	13 22	17 08
06	17	36	22	*A*	7 30	4 30	22	12 49	17 03		22	14 23	16 51
			23	*B*	7 29	4 31	23	13 40	16 46	18	23	15 24	16 33
14	03	38	24	*C*	7 27	4 33	24	14 41	16 30		24	16 24	16 15
03	17	38	25	*D*	Conv. S. *Paul*		25	15 41	16 11	19	25	17 26	16 57
			26	*E*	7 23	4 37	26	16 42	15 52		26	18 26	15 39
			27	*F*	7 22	4 38	27	17 43	15 34	19	27	19 27	15 20
11	03	32	28	*G*	7 20	4 40	28	18 44	15 15		28	20 28	15 01
19	20	17	29	*A*	7 18	4 40	29	19 44	14 56	19	29	21 28	14 42
			30	*B*	K. *Charles* B.		30	20 45	14 37		30	22 29	14 23
08	13	16	31	*C*	7 14	4 46	31	21 46	14 18	20	31	22 30	14 02

January.

1698.	Second Year. ⊙ in Capricorn. Suns Place. D. M.	Suns Decli. D. M.	Diff. of Decli.	1699.	Third Year. ⊙ in Capricorn. Suns Place. D. M.	Suns Decli. D. M.
1	21 47	21 44	10	1	21 32	21 46
2	22 48	21 34		2	22 33	21 36
3	23 49	21 23	10	3	23 35	21 26
4	24 51	21 13		4	24 36	21 15
5	25 52	21 01	11	5	25 37	21 04
6	26 53	20 50		6	26 38	20 53
7	27 54	20 38	12	7	27 39	20 41
8	28 55	20 26		8	28 40	20 29
9	29 56	20 13	13	9	29 41	20 16
10	♒ 57	20 00		10	♒ 42	20 03
11	01 58	19 46	14	11	01 43	19 50
12	02 59	19 32		12	02 44	19 36
13	04 00	19 18	14	13	03 45	19 22
14	05 01	19 04		14	04 46	19 07
15	06 02	18 49	15	15	05 47	18 52
16	07 03	18 33		16	06 48	18 37
17	08 04	18 18	16	17	07 49	18 22
18	09 05	18 02		18	08 50	18 06
19	11 06	17 46	16	19	09 51	17 50
20	12 07	17 29		20	10 52	17 33
21	13 08	17 12	17	21	11 53	17 16
22	14 08	16 55		22	12 54	16 59
23	15 09	16 38	18	23	13 55	16 42
24	16 10	16 20		24	14 55	16 24
25	17 11	16 02	18	25	15 56	16 06
26	17 12	15 43		26	16 57	15 48
27	18 12	15 25	19	27	17 58	15 29
28	19 12	15 06		28	18 58	15 11
29	20 14	14 47	20	29	19 59	14 52
30	21 14	14 28		30	21 00	14 32
31	22 15	14 08		31	22 00	14 13

South Declination decreasing.

THE Foreign Account.

And

The Southing of the Stars just at Midnight.

11	D	Each Star is set down just against the day when it comes to the South at Midnight; by which you may see what Stars are in Observation, and at what h. of the Night. For the Stars before, come to the South so much before Midnight; and the Stars after, so much after Midnight as they are distant in days, allowing one hour for 15 days, and 2 hours for a Month.
12	E	
13	F	
14	G	
15	A	
16	B	
17	C	
18	D	
19	E	
20	F	
21	G	
22	A	
23	B	
24	C	
25	D	Conver. of S. *Paul.*
26	E	
27	F	South Arms of the
28	G	(Crab, 13.8.N.
29	A	
30	B	
31	C	
1	D	*FEBRUARY.*
2	E	Purifica. of V. *Mary.*
3	F	Hydra's Heart, 7.12.S.
4	G	
5	A	The Figures following each Star, shew the
6	B	Degrees and Minutes
7	C	of Declination, N.
8	D	North, S. South.
9	E	
10	F	

February hath XXVIII Days.

The Prime.	The time of the New Moon. H.	M.	Month day.	Week day.	The English Kalendar. Suns rising H. M.	Suns setting H. M.	*Leap Year.* ⊙ in Aquarius. 1696.	Suns Place. D. M.	Suns Decli. D. M.	Diff. of Decli.	*First Year.* ⊙ in Aquarius. 1697.	Suns Place. D. M.	Suns Decli. D. M.
16	18	13	1	D	7 12	4 48	1	22 46	13 58	20	1	23 30	13 43
			2	E	Puri. V. *Mary*		2	23 47	13 38		2	24 31	13 23
05	01	51	3	F	7 09	4 51	3	24 47	13 18	20	3	25 31	13 03
	22	16	4	G	7 07	4 53	4	25 48	12 58		4	26 32	12 43
			5	A	7 05	4 55	5	26 48	12 37	21	5	27 32	12 22
02	16	31	6	B	7 03	4 57	6	27 49	12 16		6	28 33	12 01
			7	C	7 01	4 56	7	28 49	11 55	21	7	29 33	11 40
			8	D	Sun in Pisces.		8	29 50	11 34		8	♓ 34	11 18
09	07	51	9	E	6 57	5 03	9	♓ 50	11 13	22	9	01 34	10 57
07	21	31	10	F	6 55	5 04	10	01 50	10 51		10	02 35	10 35
			11	G	6 53	5 07	11	02 51	10 30	22	11	03 35	10 14
15	01	26	12	A	6 51	5 09	12	03 51	10 08		12	04 35	09 52
04	14	50	13	B	6 49	5 11	13	04 51	09 46	23	13	05 35	09 30
			14	C	Valentine.	12	14	05 51	09 24		14	06 35	09 07
	21	57	15	D	6 46	5 14	15	06 52	09 01	23	15	07 36	08 45
			16	E	6 44	5 16	16	07 52	08 39		16	08 36	08 23
01	16	32	17	F	6 42	5 18	17	08 52	08 16	23	17	09 36	08 00
10	11	31	18	G	6 40	5 20	18	09 52	07 54		18	10 36	07 37
09	22	57	19	A	6 38	5 22	19	10 52	07 31	23	19	11 36	07 14
17	20	30	20	B	6 36	5 24	20	11 52	07 08		20	12 36	06 51
06	03	21	21	C	6 34	5 26	21	12 52	06 45	23	21	13 36	06 28
14	18	19	22	D	6 32	5 28	22	13 52	06 22		22	14 36	06 05
			23	E	6 30	5 30	23	14 52	05 59	23	23	15 36	05 42
03	10	50	24	F	S. *Matthias* A.		24	15 52	05 36		24	16 36	05 19
			25	G	6 26	5 34	25	16 52	05 13	23	25	17 35	04 56
	20	48	26	A	6 24	5 36	26	17 52	04 45		26	18 35	04 32
			27	B	6 22	5 38	27	18 52	04 26	24	27	19 35	04 09
19	11	04	28	G	6 20	5 40	28	19 51	04 02		28	20 35	03 45
							29	20 51	03 3[illegible]				

When it is Leap-Year, *February* hath 29 days, and then St. *Matthias* is on the 25*th* Day.

February.

1698.	Second Year. ⊙ in Aquarius. Suns Place. D.	M.	Suns Decli. D.	M.	Diff. of Decli.	1699.	Third Year. ⊙ in Aquarius. Suns Place. D.	M.	Suns Decli. D.	M.	South Declination.	THE Foreign Account. And The Southing of the Stars just at Midnight.		
1	23	16	13	48	20	1	23	01	13	53		11	G	
2	24	16	13	28		2	24	01	13	33		12	A	
3	25	17	13	08	20	3	25	02	13	13		13	B	Lion's Heart, 13.36.N.
4	26	17	12	48		4	26	02	12	53		14	C	
5	27	18	12	27	21	5	27	03	12	32		15	D	Lion's Neck, 25.5.N.
6	28	18	12	06		6	28	03	12	10		16	E	
7	29	19	11	45	22	7	29	04	11	50		17	F	
8	♌	19	11	24		8	♍	04	11	29		18	G	
9	01	19	11	02	22	9	01	05	11	08		19	A	
10	02	20	10	41		10	02	05	10	46		20	B	
11	03	20	10	19	22	11	03	05	10	24		21	C	
12	04	20	09	57		12	04	06	10	02		22	D	
13	05	20	09	35	23	13	05	06	09	40		23	E	
14	06	21	09	13		14	06	06	09	18		24	F	*Matthias* Apostle.
15	07	21	08	51	23	15	07	06	08	56		25	G	(12.N.
16	08	21	08	28		16	08	06	08	34		26	A	Great Bear's side, 58.
17	09	21	08	05	23	17	09	07	08	11		27	B	Great Bear's back, 63.
18	10	21	07	43		18	10	07	07	48		28	C	(55.N.
19	11	21	07	20	23	19	11	07	07	26		1	D	*MARCH.*
20	12	21	06	57		20	12	07	07	03		2	E	
21	13	21	06	34	23	21	13	07	06	40		3	F	Lion's back, 22.22.N
22	14	21	06	11		22	14	07	06	17		4	G	
23	15	21	05	48	23	23	15	07	06	53		5	A	
24	16	21	05	25		24	16	07	05	30		6	B	
25	17	21	05	01	23	25	17	06	05	07		7	C	
26	18	21	04	38		26	18	06	04	43		8	D	
27	19	21	04	14	24	27	19	06	04	20		9	E	
28	20	20	03	51		28	20	06	03	57		10	F	

March hath XXXI Days.

The Prime.	New Moon.	The time of the	Month day.	Week day.	The English Kalendar. Suns rising	Suns setting	*Leap Year.* ⊙ in Pisces. 1696. Suns Place.	Suns Decli.	Diff. of Decli.	*First Year.* ⊙ in Pisces. 1697. Suns Place.	Suns Decli.
	H. M.				H. M.	H. M.	D. M.	D. M.		D. M.	D. M.
08	19	32	1	D	David. 5 42		1 21 51	03 15	24	1 21 34	03 22
			2	E	6 16	5 44	2 22 50	02 51		2 22 34	02 58
16	04	03	3	F	6 14	5 46	3 23 50	02 28	24	3 23 34	02 34
05	13	21	4	G	6 12	5 48	4 24 50	02 04		4 24 33	02 11
	15	25	5	A	6 10	5 50	5 25 49	01 41	24	5 25 33	01 47
			6	B	6 08	5 52	6 26 49	01 17		6 26 33	01 23
02	10	30	7	C	6 06	5 54	7 27 48	00 53	24	7 27 32	01 00
			8	D	6 04	5 56	8 28 48	00 29		8 28 32	00 36
10	16	18	9	E	6 02	5 58	9 29 47	00 06	24	9 29 31	00 12
18	21	57	10	F	Sun in Aries.		10 ♈ 47	N 18		10 ♈ 30	N 12
			11	G	Gregory. 02		11 01 46	00 42	24	11 01 30	00 35
07	05	14	12	A	5 46	6 04	12 02 45	01 05		12 02 29	00 59
15	14	02	13	B	5 54	6 06	13 03 44	01 29	24	13 03 28	01 22
			14	C	5 52	6 08	14 04 44	01 52		14 04 28	01 46
04	05	41	15	D	5 50	6 10	15 05 43	02 16	24	15 05 27	02 10
			16	E	5 48	6 12	16 06 42	02 39		16 06 26	02 33
	15	39	17	F	5 46	6 14	17 07 41	03 03	24	17 07 25	02 56
01	22	06	18	G	Edward.		18 08 40	03 26		18 08 24	03 20
09	20	54	19	A	5 44	6 18	19 09 39	03 49	23	19 09 23	03 43
			20	B	5 40	6 20	20 10 38	04 13		20 10 22	04 06
17	05	15	21	C	5 38	6 22	21 11 37	04 36	23	21 11 21	04 30
06	12	59	22	D	5 36	6 24	22 12 36	04 59		22 12 20	04 53
			23	E	5 34	6 26	23 13 35	05 22	23	23 13 19	05 16
14	09	46	24	F	5 32	6 28	24 14 34	05 45		24 14 18	05 39
			25	G	An. V. *Mary*		25 15 33	06 08	23	25 15 17	06 01
03	04	02	26	A	5 28	6 32	26 16 32	06 30		26 16 16	06 24
			27	B	5 26	6 34	27 17 31	06 53	23	27 17 15	06 47
	10	56	28	G	5 24	6 36	28 18 30	07 15		28 18 14	07 09
19	22	08	29	D	5 22	6 38	29 19 28	07 38	23	29 19 12	07 32
			30	E	5 20	6 40	30 20 27	08 00		30 20 11	07 54
08	08	12	31	F	5 18	6 4	31 21 26	08 22	22	31 21 10	08 16

March.

Second Year. ☉ in Pisces. 1698.	Suns Place. D.	M.	Suns Decli. D.	M.	Diff. of Decli.	Third Year. ☉ in Pisces. 1699.	Suns Place. D.	M.	Suns Decli. D.	M.		THE Foreign Account. And The Southing of the Stars just at Midnight.		
1	21	20	03	27	24	1	21	06	03	33		11	G	
2	22	20	03	04		2	22	05	03	09		12	A	Lion's Tail, 16.28.N.
3	23	19	02	40	24	3	23	05	02	46		13	B	Great Bear's Thigh,
4	24	19	02	16		4	24	05	02	22		14	C	(55.36.N.
5	25	19	01	53	24	5	25	04	01	58		15	D	
6	26	18	01	29		6	26	04	01	35		16	E	
7	27	18	01	05	24	7	27	03	01	11	South Declination.	17	F	
8	28	17	00	42		8	28	03	00	47		18	G	
9	29	17	00	18	24	9	29	02	00	24		19	A	
10	♈	16	N	06		10	♈	02	00	00		20	B	
11	01	15	00	29	24	11	01	01	N	24		21	C	
12	02	15	00	53		12	02	00	00	47		22	D	
13	03	14	01	17	24	13	03	00	01	11		23	E	
14	04	13	01	40		14	04	59	01	35		24	F	
15	05	12	02	04	24	15	05	58	01	58		25	G	Annunc. of V. *Mary*
16	06	12	02	27		16	06	57	02	22		26	A	
17	07	11	02	51	24	17	07	56	02	46		27	B	
18	08	10	03	14		18	08	56	03	09	North Declination increasing.	28	C	
19	09	09	03	38	23	19	09	55	03	32		29	D	
20	10	08	04	01		20	10	54	03	55		30	E	First in Great Bear's
21	11	07	04	24	23	21	11	53	04	18		31	F	(Tail, 57.50.N.
22	12	06	04	47		22	11	52	04	42		1	G	*APRIL.*
23	13	05	05	10	23	23	12	51	05	05		2	A	
24	14	04	05	33		24	13	50	05	28		3	B	
25	15	03	05	56	23	25	14	49	05	50		4	C	
26	16	02	06	19		26	15	47	06	13		5	D	
27	16	00	06	41	23	27	16	46	06	36		6	E	(mon, 9.21.S.
28	17	59	07	04		28	17	45	06	58		7	F	Virgins Spike, Aci-
29	18	58	07	26	22	29	18	44	07	21		8	G	Second in Great
30	19	57	07	49		30	19	43	07	44		9	A	(Bears Tail, 56.44.N.
31	20	55	08	11		31	20	41	08	05		10	B	

April hath XXX Days.

The Prime.	The time of the New Moon.	Month Day.	Week Day.	The English Kalendar. Suns rising	Suns setting	*Leap Year.* ☉ in Aries. 1696. Suns Place.	Suns Decli.	Diff. of Decli.	*First Year.* ☉ in Aries. 1697. Suns Place.	Suns Decli.
	H. M.			H. M.	H. M.	D. M.	D. M.		D. M.	D. M.
16	14 08	1	G	5 16	6 44	1 22 24	08 44	22	1 22 08	08 38
		2	A	5 14	6 46	2 23 23	09 06		2 23 07	09 00
05	01 41	3	B	5 16	6 44	3 24 21	09 27	22	3 24 05	09 22
	09 01	4	C	Ambrose.		4 25 20	09 49		4 25 04	09 43
		5	D	5 08	6 52	5 26 18	10 10	21	5 26 02	10 04
02	03 06	6	E	5 06	6 54	6 27 17	10 31		6 27 01	10 26
10	18 15	7	F	5 04	6 56	7 28 15	10 52	21	7 27 59	10 47
		8	G	5 03	6 57	8 29 14	11 13		8 28 58	11 08
18	06 29	9	A	Sun in Taur.		9 ♉ 12	11 34	20	9 29 56	11 28
07	13 28	10	B	5 00	7 00	10 01 10	11 54		10 ♉ 55	11 49
		11	C	4 58	7 02	11 02 09	12 15	20	11 01 53	12 09
15	04 30	12	D	4 56	7 04	12 03 07	12 35		12 02 51	12 29
04	21 06	13	E	4 54	7 06	13 04 05	12 54	20	13 03 49	12 49
		14	F	4 52	7 08	14 05 03	13 14		14 04 48	13 09
		15	G	4 50	7 10	15 06 02	13 34	19	15 05 46	13 28
	06 46	16	A	4 49	7 11	16 07 00	13 53		16 06 44	13 47
01	21 46	17	B	4 47	7 13	17 07 58	14 12	19	17 07 42	14 07
09	06 37	18	C	4 45	7 15	18 08 56	14 30		18 08 40	14 25
		19	D	4 43	7 17	19 09 54	14 49	18	19 09 38	14 44
06	11 00	20	E	4 41	7 19	20 10 52	15 07		20 10 36	15 02
		21	F	4 40	7 20	21 11 50	15 25	18	21 11 34	15 20
14	01 34	22	G	4 38	7 22	22 12 48	15 43		22 12 32	15 38
03	21 08	23	A	S. *George*	7 24	23 13 46	16 00	17	23 13 30	16 56
		24	B	4 35	7 25	24 14 44	16 18		24 14 28	16 13
	22 09	25	C	S. *Mark* Eva.		25 15 42	16 35	17	25 15 26	16 30
		26	D	4 31	7 29	26 16 40	16 52		26 16 24	16 47
19	06 59	27	E	4 29	7 31	27 17 38	17 08	17	27 17 22	17 03
08	14 16	28	F	4 28	7 32	28 18 30	17 24		28 18 20	17 20
16	15 02	29	G	4 26	7 34	29 19 33	17 40	16	29 19 18	17 36
		30	A	4 25	7 35	30 20 31	17 55		30 20 15	17 51

April.

1691	Second Year, ☉ in Taurus. Suns Place. D. M.	Suns Decli. D. M.	Diff. of Decl.	1692	Third Year, ☉ in Taurus. Suns Place. D. M.	Suns Decli. D. M.
1	21 54	08 33	22	1	21 40	08 27
2	22 53	08 55		2	22 38	08 49
3	23 51	09 16	22	3	23 37	09 11
4	24 50	09 38		4	24 36	09 33
5	25 48	09 59	21	5	25 34	09 54
6	26 47	10 21		6	26 33	10 15
7	27 45	10 42	21	7	27 31	10 37
8	28 44	11 03		8	28 29	10 57
9	29 42	11 23	20	9	29 28	11 18
10	♉ 40	11 44		10	♉ 26	11 39
11	01 38	12 05	20	11	01 25	11 59
12	02 37	12 24		12	02 23	12 19
13	03 35	12 44	20	13	03 21	12 39
14	04 33	13 04		14	04 19	12 59
15	05 32	13 24	19	15	05 18	13 19
16	06 30	13 43		16	06 16	13 38
17	07 28	14 02	19	17	07 14	13 57
18	08 26	14 21		18	08 12	14 16
19	09 24	14 39	18	19	09 10	14 35
20	10 22	14 58		20	10 08	14 53
21	11 20	15 16	18	21	11 06	15 12
22	12 18	15 34		22	12 04	15 30
23	13 16	15 52	17	23	13 02	15 47
24	14 14	16 05		24	14 00	16 05
25	15 12	16 26	17	25	14 58	16 22
26	16 10	16 43		26	15 56	16 39
27	17 08	16 59	17	27	16 54	16 55
28	18 06	17 16		28	17 52	17 12
29	19 04	17 32	16	29	18 50	17 28
30	20 03	17 47		30	19 47	17 44

North Declination.

THE Foreign Account. And The Southing of the Stars just at Midnight.

11	C	
12	D	
13	E	
14	F	
15	G	Third in Great Bears Tail, 51.3.N.
16	A	
17	B	
18	C	Centaur's shoulder, 35.16.S.
19	D	
20	E	
21	F	
22	G	Arcturus, 21.1.1.N.
23	A	
24	B	
25	C	S. *Mark* Evangelist.
26	D	
29	E	
28	F	
29	G	34.S.
30	A	South Ballance, 14.
1	B	*MAY.*
2	C	
3	D	
4	E	
5	F	
6	G	
7	A	38.N.
8	B	Foremost Guard, 75.
9	C	North Ballance, 8.15.
10	D	S.

May hath XXX Days.

The Prime.	The time of the New Moon.	Month day.	Week day.	The English Kalendar.		Leap Year. ⊙ in Taurus.			Diff. of Decli.	First Year. ⊙ in Taurus		
				Suns rising	Suns setting	1692.	Suns Place.	Suns Decli.		1693.	Suns Place.	Suns Decli.
	H. M.			H. M.	H. M.		D. M.	D. M.			D. M.	D. M.
16	01 00	1	B	*Philip & Jacob*		1	♉ 21 29	18 11		1	♉ 12 13	18 07
05	14 43	2	C	4 21	7 37	2	22 27	18 26	15	2	22 11	18 22
		3	D	4 20	7 40	3	23 25	18 40		3	23 09	18 36
	20 51	4	E	4 18	7 42	4	24 22	18 55	14	4	24 06	18 51
		5	F	4 16	7 44	5	25 20	19 09		5	25 04	19 05
02	16 33	6	G	4 15	7 45	6	26 17	19 22	14	6	28 02	19 19
		7	A	4 14	7 46	7	27 15	19 36		7	28 59	19 32
10	05 29	8	B	4 13	7 47	8	28 13	19 49	13	8	27 57	19 45
18	01 39	9	C	4 11	7 49	9	29 10	20 02		9	28 54	19 58
07	08 59	10	D	Sun in Gem.		10	♊ 08 20	14 13		10	29 52	20 11
15	06 12	11	E	4 08	7 52	11	01 03	20 26		11	♊ 49	20 23
04	12 44	12	F	4 07	7 53	12	02 03	20 38	12	12	01 47	20 34
	15 03	13	G	4 06	7 54	13	03 00	21 49		13	02 44	20 46
		14	A	4 05	7 55	14	03 58	21 00	11	14	03 42	20 57
01	18 40	15	B	4 04	7 56	15	04 55	21 11		15	04 39	21 08
09	14 40	16	C	4 03	7 57	16	05 53	21 21	10	16	05 37	21 18
17	04 15	17	D	4 02	7 58	17	06 50	21 31		17	06 34	21 28
06	20 27	18	E	4 01	7 59	18	07 47	21 40	10	18	07 32	21 38
		19	F	4 00	8 00	19	08 45	21 49		19	08 29	21 47
14	18 05	20	G	3 59	8 01	20	09 42	21 58	09	20	09 27	21 56
		21	A	3 57	8 03	21	10 40	22 07		21	10 24	22 04
03	10 56	22	B	3 58	8 04	22	11 37	22 14	08	22	11 21	22 12
		23	C	3 55	8 05	23	12 34	22 22		23	12 19	22 20
	07 02	24	D	3 55	8 05	24	13 32	22 29	07	24	13 16	22 27
19	14 36	25	E	3 54	8 06	25	14 29	22 36		25	14 13	22 34
08	21 15	26	F	St. *Augustin.*		26	15 26	22 43	07	26	15 11	22 41
		27	G	3 52	8 08	27	16 24	22 45		27	16 08	22 47
16	13 00	28	A	3 52	8 08	28	17 21	22 54	06	28	17 05	22 53
05	16 22	29	B	K. C. & N. & R.		29	18 18	22 59		29	18 02	22 58
		30	C	3 50	8 10	30	19 15	23 04	05	30	19 00	23 03
		31	D	3 50	8 10	31	20 13	23 05		31	19 56	23 08

May.

1694	Second Year. ☉ in Taurus. Suns Place. D.	M.	Suns Decli. D.	M.	Dif. of Decli.	1695	Third Year. ☉ in Taurus. Suns Place. D.	M.	Suns Decli. D.	M.
1	20	55	18	03	15	1	20	45	17	59
2	21	57	18	18		2	21	43	18	14
3	22	55	18	33	14	3	22	41	18	29
4	23	52	18	47		4	23	38	18	44
5	24	50	19	01	14	5	24	36	18	58
6	25	48	19	15		6	25	34	19	12
7	26	44	19	29	13	7	26	31	19	26
8	27	43	19	42		8	27	29	19	39
9	28	40	19	55	13	9	28	26	19	52
10	29	38	20	08		10	29	24	20	05
11	♊	36	20	20	12	11	♊	22	20	17
12	01	33	20	32		12	01	19	20	29
13	02	31	20	43	11	13	02	17	20	40
14	03	28	20	54		14	03	14	20	52
15	04	26	21	05	10	15	04	12	21	03
16	05	23	21	16		16	05	09	21	13
17	06	20	21	26	10	17	06	07	21	23
18	07	18	21	35		18	07	04	21	33
19	08	15	21	45	09	19	08	01	21	42
20	09	13	21	54		20	08	59	22	51
21	10	10	22	02	08	21	09	56	22	00
22	11	07	22	10		22	10	53	22	08
23	12	05	22	18	07	23	11	51	22	16
24	13	02	22	26		24	12	48	22	24
25	14	59	22	33	07	25	13	45	22	31
26	15	57	22	39		26	14	43	22	38
27	16	54	22	46	06	27	15	40	22	44
28	17	51	22	52		28	16	37	22	50
29	17	48	22	57	05	29	17	35	22	56
30	18	46	23	02		30	18	32	23	01
31	19	43	23	07		31	19	29	23	06

North Declination decreasing.

THE Foreign Account. And The Southing of the Stars just at Midnight.

11	E	
12	F	(N
13	G	North Crown, 27.53.
14	A	Hinder Guard, 73.
15	B	(16.N.
16	C	Serpents Neck. 7.33.
17	D	(N.
18	E	
19	F	
20	G	
21	A	
22	B	
23	C	
24	D	
25	E	*Mark* Evangelist.
26	F	Scorpions Heart, 25.
27	G	(36. S.
28	A	
29	B	
30	C	
31	D	
1	E	*JUNE.*
2	F	
3	G	(13. S.
4	A	Serpentar. Knee, 15.
5	B	(N.
6	C	Hercules Head, 14.50.
7	D	
8	E	
9	F	
10	G	

June hath XXX Days.

The Prime.	The time of the New Moon.	Month day.	Week day.	The English Kalendar.	Suns rising	Suns setting	*Leap Year.* ☉ in Gemini. 1692.	Suns Place.	Suns Decli.	Diff. of Decli.	*First Year.* ☉ in Gemini. 1693.	Suns Place.	Suns Decli.
	H. M.				H. M.	H. M.		D. M.	D. M.			D. M.	D. M.
05	04 56	1	E		3 49	8 11	1	♊ 21 10	23 12	04	1	20 54	23 11
	14 36	2	F		3 49	8 11	2	22 07	23 16		2	21 51	23 15
		3	G		3 49	8 11	3	23 04	23 19	03	3	22 49	23 18
02	04 27	4	A		3 48	8 11	4	24 01	23 22		4	23 46	23 21
10	14 06	5	B		3 48	8 12	5	24 59	23 24	02	5	24 43	23 23
18	22 08	6	C		3 48	8 12	6	25 56	23 26		6	25 40	23 26
		7	D		3 47	8 13	7	26 53	23 28		7	25 37	23 27
07	06 35	8	E		3 47	8 13	8	27 50	23 29		8	26 34	23 29
		9	F		3 47	8 13	9	28 47	23 30		9	27 32	23 29
15	09 17	10	G		3 47	8 13	10	29 45	23 30		10	28 29	23 30
		11	A	St. *Barnaby.*			11	♋ 42	23 30		11	29 26	23 30
04	03 28	12	B	Sun in Canc.			12	01 39	23 29		12	♋ 23	23 30
	23 47	13	C		3 47	8 13	13	02 36	23 28	01	13	01 20	23 29
	14 40	14	D		3 47	8 13	14	03 33	23 27		14	02 18	23 28
09	21 30	15	E		3 47	8 13	15	04 30	23 25	02	15	03 15	23 26
17	08 05	16	F		3 48	8 12	16	05 27	23 23		16	04 12	23 24
		17	G	S. *Alban* Mar.			17	06 25	23 21	03	17	05 09	23 22
06	10 35	18	A		3 48	8 12	18	07 22	23 18		18	06 06	23 19
		19	B		3 49	8 11	19	08 19	23 15	04	19	07 03	23 16
14	07 49	20	C		3 49	8 11	20	09 16	23 11		20	08 00	23 12
03	23 50	21	D		3 49	8 11	21	10 13	23 07	04	21	09 58	23 08
		22	E		3 50	8 10	22	11 10	23 02		22	10 55	23 03
	14 52	23	F		3 50	8 10	23	12 08	22 57	05	23	11 52	22 58
12	21 21	24	G	St. *John Bapt.*			24	12 05	22 52		24	12 49	22 53
		25	A		3 52	8 08	25	13 02	22 46	06	25	13 46	22 48
08	04 50	26	B		3 52	8 08	26	14 59	22 40		26	14 43	22 41
		27	C		3 53	8 07	27	15 56	22 33	07	27	15 41	22 35
16	01 29	28	D		3 54	8 06	28	16 53	22 26		28	16 38	22 28
05	19 41	29	E	S. *Peter* Apo.			29	17 51	22 19	08	29	17 35	22 21
		30	F		3 56	8 04	30	18 48	22 11		30	18 32	22 13

June.

1694	Second Year, ☉ in Gemini. Suns Place. D. M.	Suns Decli. D. M.	Diff. of Decli.	Third Year, ☉ in Gemini. 1695. Suns Place. D. M.	Suns Decli. D. M.
1	20 40	23 10	04	1 20 26	23 09
2	21 37	23 14		2 21 28	23 13
3	22 35	23 17	03	3 22 21	23 16
4	23 32	23 20		4 23 18	23 20
5	24 29	23 23	02	5 24 15	23 22
6	25 26	23 25		6 25 12	23 25
7	26 23	23 27		7 26 10	23 27
8	27 21	23 28		8 27 07	23 28
9	28 18	23 29		9 28 04	23 29
10	29 15	23 30		10 29 01	23 30
11	♋ 12	23 30		11 29 58	23 30
12	01 09	23 30		12 ♋ 56	23 30
13	02 06	23 29	01	13 01 53	23 29
14	03 04	23 28		14 02 50	23 28
15	04 01	23 26	02	15 03 47	23 27
16	04 58	23 25		16 04 44	23 25
17	05 55	23 22	03	17 05 41	23 23
18	06 52	23 19		18 06 38	23 20
19	07 49	23 16	04	19 07 36	23 17
20	08 47	23 13		20 08 33	23 14
21	09 44	23 09	04	21 09 30	23 10
22	10 41	23 04		22 10 27	23 06
23	11 38	23 00	05	23 11 24	23 01
24	12 35	22 54		24 12 21	22 56
25	13 32	22 49	06	25 13 19	22 50
26	14 30	22 43		26 14 16	22 44
27	15 27	22 37	07	27 15 13	22 38
28	16 24	22 30		28 16 10	22 32
29	17 21	22 23	08	29 17 07	22 25
30	18 18	22 15		30 18 04	22 17

North Declination increasing. | North Declination decreasing.

THE Foreign Account.

And

The Southing of the Stars just at Midnight.

11	A	
12	B	
13	C	
14	D	
15	E	
16	F	(30.0.S.
17	G	*Sagitt.* Arrow Head,
18	A	Dragons Head, 51.36.
19	B	(N.
20	C	
21	D	
22	E	
23	F	
24	G	S. *John Baptist.*
25	A	
26	B	
27	C	The Harp, 38.30.N.
28	D	
29	E	
30	F	
1	G	JULY.
2	A	
3	B	
4	C	
5	D	
6	E	
7	F	
8	G	
9	A	
10	B	Swans Bill, 27.17.N.

July hath XXXI Days.

The Prime.	The time of the New Moon.	Month Day.	Week Day.	The English Kalendar. Suns rising	Suns setting	Leap Year ☉ in Cancer. 1692. Suns Place.	Suns Decli.	Diff. of Decli.	First Year ☉ in Cancer. 1693. Suns Place.	Suns Decli.
	H. M.			H. M. H. M.		D. M.	D. M.		D. M.	D. M.
		1	G	Visit. V. *Mary*		1 19 45	22 02	08	1 19 29	22 04
	02 16	2	A	3 57 8 03		2 20 42	21 54		2 20 26	21 46
02	16 25	3	B	3 58 8 02		3 21 39	21 45	09	3 21 24	21 47
10	21 40	4	C	3 59 8 01		4 22 37	21 36		4 22 21	21 38
		5	D	4 01 7 59		5 23 34	21 26	10	5 23 18	21 29
18	05 28	6	E	4 02 7 58		6 24 31	21 16		6 24 15	21 19
		7	F	4 03 7 57		7 25 28	21 06	10	7 25 13	21 09
07	04 57	8	G	4 04 7 56		8 26 26	20 55		8 26 10	20 58
15	23 59	9	A	4 05 7 55		9 27 23	20 44	11	9 27 07	20 47
		10	B	4 06 7 54		10 28 20	20 33		10 28 04	20 36
04	18 06	11	C	4 07 7 53		11 29 17	20 21	12	11 29 02	20 24
		12	D	Sun in Leo.		12 ♌ 15	20 09		12 29 59	20 12
	14 15	13	E	4 10 7 50		13 01 12	19 56	13	13 ♌ 56	20 00
01	21 49	14	F	4 11 7 49		14 02 09	19 44		14 01 54	19 47
09	16 39	15	G	Swithin. 4 8		15 03 07	19 31	13	15 02 51	19 34
17	19 47	16	A	4 14 7 46		16 04 04	19 17		16 03 48	19 21
		17	B	4 15 7 45		17 05 01	19 03	14	17 04 46	19 07
		18	C	4 17 7 43		18 05 59	18 49		18 05 43	18 53
06	11 48	19	D	Dog-days be.		19 06 56	18 35	14	19 06 40	18 39
		20	E	4 20 7 40		20 07 54	18 20		20 07 38	18 24
14	09 22	21	F	4 21 7 39		21 08 51	18 06	15	21 08 35	18 10
03	11 07	22	G	S. *M.* Madgal.		22 09 48	17 50		22 09 33	17 55
	21 31	23	A	4 25 7 35		23 10 46	17 35	16	23 10 30	17 39
		24	B	4 26 7 34		24 11 43	17 19		24 11 28	17 23
19	04 42	25	C	*James* Apost.		25 12 41	17 03	16	25 12 25	17 07
08	13 50	26	D	S. Ann. 7 30		26 13 38	16 46		26 13 24	16 51
		27	E	4 31 7 29		27 14 36	16 30	17	27 14 20	16 34
16	16 04	28	F	4 33 7 27		28 15 34	16 13		28 15 18	16 18
		29	G	4 35 7 25		29 16 31	15 56	17	29 16 15	16 00
05	10 52	30	A	4 36 7 24		30 17 29	15 38		30 17 13	15 43
	04 14	31	B	4 38 7 22		31 18 26	15 21		31 18 11	15 26

July.

Second Year. ☉ in Cancer.					Diff. of Decl.	Third Year. ☉ in Cancer.					North Declination.	THE Foreign Account. And The Southing of the Stars just at Midnight.		
Days.	Suns Place.		Suns Decli.			Days.	Suns Place.		Suns Decli.					
	D.	M.	D.	M.			D.	M.	D.	M.				
1	19	15	22	06	08	1	19	02	22	08			C	
2	20	13	21	58		2	20	59	22	00		12	D	
3	21	10	21	49	09	3	21	56	21	52		13	E	
4	22	07	21	40		4	22	53	21	43		14	F	ſ Thigh, and Vul-
5	23	04	21	31	10	5	23	50	21	33		15	G	tures Heart, 35.27.
6	24	02	21	21		6	24	48	21	24		16	A	(S.S. 2.N.
7	24	59	21	11	10	7	25	45	21	14		17	B	
8	25	56	21	01		8	26	42	21	03		18	C	
9	26	53	20	50	11	9	27	39	20	52		19	D	
10	27	51	20	39		10	28	37	20	41		20	E	
11	28	48	20	27	12	11	29	34	20	30		21	F	
12	29	45	20	15		12	29	31	20	18		22	G	
13	ſ.	42	20	03	13	13	ſ.	28	20	06		23	A	
14	01	40	19	50		14	01	26	19	53		24	B	
15	02	37	19	37	13	15	02	23	19	41		25	C	James Apoſtle.
16	03	34	19	24		16	03	21	19	27		26	D	
17	04	32	19	11	14	17	04	18	19	14		27	E	
18	05	29	18	57		18	05	15	19	00		28	F	Swans Tail, and Dol-
19	06	27	18	43	14	19	06	13	18	46	☌	29	G	phins Head, 44.6.N.
20	07	24	18	28		20	07	10	18	32		30	A	(14.57.N.
21	08	21	18	13	15	21	08	08	18	17		31	B	
22	09	19	17	58		22	09	05	18	02		1	C	AUGUST.
23	10	16	17	43	16	23	10	02	17	47		2	D	
24	11	14	17	27		24	11	00	17	31		3	E	
25	12	11	17	11	16	25	11	57	17	15		4	F	
26	13	09	16	54		26	12	55	16	59		5	G	
27	14	06	16	38	17	27	13	52	16	42		6	A	
28	15	04	16	22		28	14	50	16	26		7	B	
29	16	01	16	05	17	29	15	48	16	09		8	C	
30	16	59	15	47		30	16	45	15	52		9	D	
31	17	57	15	30		31	17	43	15	34		10	E	

August hath XXXI Days.

The Prime.	The time of the New Moon. H.	M.	Month Day.	Week Day.	The English Kalendar.	Suns rising H.	M.	Suns setting H.	M.	Leap Year. ☉ in Leo. 1696. Suns Place. D.	M.	Suns Decli. D.	M.	Decli.	First Year. ☉ in Leo. 1697. Suns Place. D.	M.	Suns Decli. D.	M.
02	21	48	1	C	Lammas.			20		1	19	24	15	03		1	19	08	15	08
			2	D		4	41	7	19	2	20	22	14	44	18	2	20	06	14	49
10	17	07	3	E		4	43	7	17	3	21	19	14	26		3	21	04	14	31
18	15	21	4	F		4	44	7	16	4	22	17	14	07	19	4	22	01	14	12
			5	G		4	46	7	14	5	23	15	13	48		5	22	59	13	44
07	05	38	6	A		4	48	7	12	6	24	13	13	29	19	6	23	57	13	35
			7	B		4	50	7	10	7	25	10	13	10		7	24	55	13	15
15	15	07	8	C		4	52	7	08	8	26	08	12	51	19	8	25	52	12	56
			9	D		4	53	7	07	9	27	06	12	31		9	26	50	12	36
04	07	26	10	E	Laurence.					10	28	04	12	11	20	10	27	48	12	16
	22	09	11	F		4	57	7	03	11	29	02	11	51		11	28	46	11	56
01	16	57	12	G		4	59	7	01	12	29	00	11	30	20	12	29	44	11	36
09	12	32	13	A	Sun in Virgo.					13	♍	58	11	10		13	♍	42	11	16
17	09	10	14	B		5	02	6	58	14	01	56	10	49	21	14	01	40	10	55
			15	C		5	04	6	56	15	02	54	10	28		15	02	38	10	34
06	04	08	16	D		5	06	6	54	16	03	52	10	07	21	16	03	36	10	13
			17	E		5	08	6	52	17	04	50	09	46		17	04	34	09	52
14	10	10	18	F		5	10	6	50	18	05	48	09	25	21	18	05	32	09	31
03	21	26	19	G		5	12	6	48	19	06	46	09	03		19	06	30	09	09
			20	A		5	14	6	46	20	07	44	08	42	21	20	07	28	08	48
	04	44	21	B		5	16	6	44	21	08	42	08	20		21	08	27	08	26
19	13	21	22	C		5	18	6	42	22	09	41	07	58	22	22	09	25	08	04
			23	D		5	20	6	40	23	10	39	07	36		23	10	23	07	42
08	01	04	24	E	S. Bartholo.					24	11	37	07	14	22	24	11	21	07	20
			25	F		5	24	6	36	25	12	35	06	52		25	12	19	06	58
			26	G		5	26	6	34	26	13	34	06	29	23	26	13	18	06	35
05	22	39	27	A		5	28	6	32	27	14	32	06	07		27	14	16	06	13
	22	20	28	B	Dog days en.					28	15	30	05	44	23	28	15	15	05	50
			29	C	S. *Joh.* behea.					29	16	29	05	21		29	16	13	05	28
02	05	49	30	D		5	33	6	27	30	17	27	04	59	23	30	17	11	05	05
			31	E		5	35	6	25	31	18	26	04	36		31	18	10	04	42

August.

Second Year. ☉ in Leo. 1692.	Suns Place. D.	M.	Suns Decli. D.	M.	Dec. of Decli.	Third Year. ☉ in Leo. 1692.	Suns Place. D.	M.	Suns Decli. D.	M.		THE Foreign Account. And The Southing of the Stars just at Midnight.		
1	18	54	15	12	18	1	18	40	15	16		11	F	
2	19	52	14	54		2	19	38	14	58		12	G	Pegasus Mouth, and
3	20	50	14	36	19	3	20	36	14	40		13	A	Capricorns Tail.
4	21	47	14	17		4	21	33	14	22		14	B	
5	22	45	13	58	19	5	22	31	14	03		15	C	
6	23	43	13	39		6	23	29	13	44		16	D	
7	24	41	13	20	19	7	24	27	13	25		17	E	
8	25	38	13	01		8	25	24	13	05		18	F	
9	26	36	12	41	20	9	26	22	12	46	South Declination decreasing	19	G	
10	27	34	12	21		10	27	20	12	26		20	A	
11	28	32	12	01	20	11	28	18	12	06		21	B	
12	29	30	11	41		12	29	16	11	46		22	C	
13	♑	28	11	21	21	13	♑	14	11	26		23	D	
14	01	26	11	00		14	01	12	11	05		24	E	S. *Bartholomew* Apo.
15	02	24	10	39	21	15	02	10	10	44		25	F	
16	03	22	10	18		16	03	08	10	23		26	G	
17	04	20	09	57	21	17	04	06	10	02		27	A	
18	05	18	09	36		18	05	04	09	14		28	B	
19	06	16	09	15	22	19	06	02	09	20		29	C	
20	07	14	08	53		20	07	00	08	58		30	D	
21	08	12	08	31	22	21	07	58	08	37		31	E	*Fomahaut.*
22	09	11	08	09		22	08	57	08	15		1	F	*SEPTEMBER.*
23	10	09	07	47	22	23	09	55	07	53		2	G	Pegasus Shoulder, 26.
24	11	07	07	25		24	10	53	07	31		3	A	(15. N. and Wing,
25	12	05	07	03	23	25	11	51	07	09		4	B	(13. 25. N.
26	13	04	06	41		26	12	50	06	46		5	C	
27	14	02	06	18	23	27	13	48	06	24		6	D	
28	15	00	05	56		28	14	46	06	01		7	E	
29	15	59	05	33	23	29	15	45	05	39		8	F	
30	16	57	05	10		30	16	43	05	16		9	G	
31	17	56	04	48		31	17	42	04	53		10	A	

September hath XXX Days.

The Prime.	New Moon.	The time of the	Month day.	Week day.	The English Kalendar.		Leap Year. ⊙ in Virgo.			Diff. of Decli.	First Year. ⊙ in Virgo.		
					Suns rising	Suns setting	1692.	Suns Place.	Suns Decli.	1693.		Suns Place.	Suns Decli.
	H.	M.			H. M.	H. M.		D. M.	D. M.			D. M.	D. M.
10	12	45	1	F	5 37	6 23	1	19 24	04 13	24	1	19 08	04 19
			2	G	5 39	6 21	2	20 23	03 50		2	20 07	03 56
18	08	35	3	A	5 41	6 19	3	21 22	03 27	24	3	21 06	03 33
			4	B	5 43	6 17	4	22 20	03 03		4	22 04	03 10
07	08	24	5	C	5 45	6 15	5	23 19	02 40	24	5	23 03	02 47
			6	D	5 47	6 13	6	24 17	02 17		6	24 01	02 23
15	05	59	7	E	5 49	6 11	7	25 16	01 54	24	7	25 00	02 00
04	20	10	8	F	N B.V. *Mary*		8	26 15	01 30		8	25 55	01 37
			9	G	5 53	6 07	9	27 14	01 07	24	9	26 58	01 13
	05	55	10	A	5 55	6 05	10	28 13	00 43		10	27 57	00 50
			11	B	5 56	6 04	11	29 11	00 20	24	11	28 55	00 26
01	13	13	12	C	5 59	6 01	12	♎ 10	*So.* 31		12	29 54	00 03
09	22	37	13	D	Sun in Libra.		13	01 09	00 27	24	13	♎ 53	*So.* 24
			14	E	Holy Crofs.		14	02 08	00 51		14	01 52	00 44
			15	F	6 05	5 55	15	03 07	01 14	24	15	02 51	01 08
17	09	11	16	G	6 07	5 53	16	04 06	01 38		16	03 50	01 31
06	08	02	17	A	Lambart.		17	05 05	02 01	24	17	04 49	01 55
14	21	53	18	B	6 10	5 50	18	06 04	02 25		18	05 48	02 18
			19	C	6 12	5 48	19	07 04	02 48	24	19	06 47	02 42
03	06	57	20	D	6 14	5 46	20	08 03	03 11		20	07 47	03 10
	13	59	21	E	S. *Matth.* Ap.		21	09 02	03 35	23	21	08 46	03 28
12	13	20	22	F	6 18	5 42	22	10 01	03 58		22	09 45	03 52
08	02	35	23	G	6 20	5 40	23	11 00	04 21	23	23	10 44	04 15
16	06	30	24	A	6 22	5 38	24	12 00	04 45		24	11 44	04 38
05	16	55	25	B	Cyprian.		25	12 59	05 08	23	25	12 43	05 02
	07	33	26	C	6 26	5 34	26	13 59	05 31		26	13 42	05 25
02	14	24	27	D	6 28	5 32	27	14 58	05 54	23	27	14 42	05 48
			28	E	6 30	5 30	28	15 57	06 17		28	15 41	06 11
			29	F	S. *Micha.* An		29	16 57	06 40	23	29	16 41	06 34
			30	G	S. *Hier.* 5	26	30	17 56	07 03		30	17 40	06 57

September.

1694	Second Year: ☉ in Virgo. Suns Place. D.	M.	Suns Decli. D.	M.	Diff. of Decli.	Third Year: ☉ in Virgo. 1695. Suns Place. D.	M.	Suns Decli. D.	M.		THE Foreign Account. And The Southing of the Stars just at Midnight.		
1	18	54	04	25	24	1 18	40	04	30		11	B	
2	19	53	04	02		2 19	39	04	07		12	C	
3	20	51	03	39	24	3 20	37	03	44		13	D	
4	21	50	03	15		4 21	36	03	21		14	E	
5	22	49	02	52	24	5 22	34	02	58		15	F	
6	23	47	02	29		6 23	33	02	35		16	G	
7	24	46	02	06	24	7 24	32	02	11		17	A	
8	25	45	01	42		8 25	30	01	48		18	B	
9	26	43	01	19	24	9 26	29	01	25		19	C	(27.14.N. 57.18.N.
10	27	42	00	56		10 27	28	01	01		20	D	Head *And. Caſ.* chair,
11	28	41	00	32	24	11 28	27	00	38		21	E	*M. A. Pegaſus* wing
12	29	40	00	09		12 29	26	00	14		22	F	(tip, 13. 18. N.
13	♎	39	*So.*	15	24	13 ♎	25	*So.*	09		23	G	North in Whale's
14	01	38	00	38		14 01	24	00	33		24	A	(Tail, 14.41.S.
15	02	37	01	02	24	15 02	23	00	56		25	B	
16	03	36	01	25		16 03	22	01	20		26	C	
17	04	35	01	49	24	17 04	21	01	43		27	D	
18	05	34	02	12		18 05	20	02	07		28	E	
19	06	33	02	36	24	19 06	19	02	30		29	F	S. *Michael* Arch-ang.
20	07	32	02	59		20 07	18	02	54		30	G	South in Whales tail.
21	08	31	03	23	23	21 08	17	03	17		1	A	*OCTOBER.*
22	09	31	03	46		22 09	16	03	40		2	B	Pole Star, 87. 30. N.
23	10	30	04	09	23	23 10	16	04	04		3	C	(19. 51. 8.
24	11	29	04	33		24 11	15	04	27		4	D	
25	12	29	04	56	23	25 12	14	04	50		5	E	
26	13	28	05	19		26 13	14	05	14		6	F	South in *Andromeda's*
27	14	27	05	42	23	27 14	13	05	37		7	G	(Girdle, 33.52.N.
28	15	27	06	05		28 15	12	06	00		8		
29	16	26	06	28	23	29 16	12	06	23		9	B	
30	17	26	06	51		30 17	11	06	46		10	C	*Caſſiopeia's* knee, 58.
													(27. N.

North Declination decreaſing.

South Declination increaſing.

October hath XXXI Days.

The Prime.	The time of the New Moon. H.	M.	Month day.	Week day.	The English Kalendar. Suns rising H.	M.	Suns setting H.	M.	Leap Year. ☉ in Libra. 1696.	Suns Place. D.	M.	Suns Decli. D.	M.	Diff. of Decli.	First Year. ☉ in Libra. 1697.	Suns Place. D.	M.	Suns Decli. D.	M.
10	81	45	1	A	6	36	5	24	1	18	56	07	26	23	1	18	40	07	19
18	18	55	2	B	6	38	5	22	2	19	56	07	48		2	19	39	07	42
			3	C	6	40	5	20	3	20	55	08	11	22	3	20	39	08	04
			4	D	6	42	5	18	4	21	55	08	33		4	21	39	08	27
07	01	09	5	E	6	44	5	16	5	22	55	08	55	22	5	22	38	08	49
15	20	13	6	F	6	46	5	14	6	23	54	09	17		6	23	38	09	11
			7	G	6	48	5	12	7	24	54	09	39	22	7	24	38	09	33
04	07	32	8	A	6	50	5	10	8	25	54	10	01		8	25	38	09	55
	14	55	9	B	S. *Dennis*,			08	9	26	54	10	23	22	9	26	37	10	17
			10	C	6	54	5	06	10	27	54	10	45		10	27	37	10	39
01	01	04	11	D	6	56	5	04	11	28	54	11	06	21	11	28	37	11	00
			12	E	6	58	5	02	12	29	53	11	27		12	29	37	11	22
09	10	42	13	F	Sun in Scorp.				13	m.	53	11	48	21	13	m.	37	11	43
17	00	15	14	G	7	02	4	58	14	01	53	12	09		14	01	37	12	04
06	11	49	15	A	7	03	4	57	15	02	53	12	30	21	15	02	37	12	24
			16	B	7	05	4	53	16	03	54	12	50		16	03	37	12	45
14	08	45	17	C	7	07	4	53	17	04	54	13	11	20	17	04	37	13	05
03	16	17	18	D	S. *Luke* Evan.				18	05	54	13	31		18	05	37	13	25
			19	E	7	11	4	49	19	06	54	13	51	20	19	06	38	13	45
	01	18	20	F	7	13	4	47	20	07	54	14	10		20	07	38	14	05
19	13	10	21	G	7	14	4	46	21	08	54	14	30	19	21	08	38	14	25
			22	A	7	16	4	44	22	09	55	14	49		22	09	38	14	44
			23	B	7	18	4	42	23	10	55	15	08	19	23	10	39	15	03
08	07	25	24	C	7	20	4	40	24	11	55	15	27		24	11	39	15	22
16	10	50	25	D	Crispine,			38	25	12	56	15	45	18	25	12	39	15	40
05	20	07	26	E	7	23	4	37	26	13	56	16	03		26	13	40	15	59
	16	46	27	F	7	25	4	35	27	14	56	16	21	18	27	14	40	16	17
			28	G	S. *Sim.* & S. *Ju.*				28	15	57	16	39		28	15	40	16	34
02	00	36	29	A	7	29	4	31	29	16	57	16	56	17	29	16	41	16	52
			30	B	7	30	4	30	30	17	58	17	13		30	17	41	17	09
10	09	26	31	C	7	32	4	28	31	18	58	17	30		31	18	42	17	26

October.

Second Year. ☉ in Libra. 1698.	Suns Place. D.	M.	Suns Decli. D.	M.	Diff. of Decli.	Third Year. ☉ in Libra. 1699.	Suns Place. D.	M.	Suns Decli. D.	M.		THE Foreign Account. And The Southing of the Stars just at Midnight.		
1	18	25	07	14	23	1	18	11	07	08		11	D	
2	19	25	07	36		2	19	10	07	31		12	E	
3	20	25	07	59	22	3	20	10	07	54		13	F	
4	21	24	08	22		4	21	10	08	16		14	G	
5	22	24	08	44	22	5	22	09	08	38		15	A	
6	23	24	09	06		6	23	09	09	01		16	B	
7	24	23	09	28	22	7	24	09	09	23		17	C	
8	25	23	09	50		8	25	09	19	45		18	D	S. *Luke* Evangelist.
9	26	23	10	12	22	9	26	08	10	07	South Declination increasing.	19	E	N. and S. in the Rams
10	27	23	10	34		10	27	08	10	28		20	F	(Horn, 19. 9. N. 17.
11	28	23	10	55	21	11	28	08	10	50		21	G	38. N.
12	29	23	11	16		12	29	08	11	11		22	A	Rams head, 21. 51. N.
13	m	23	11	38	21	13	m	08	11	32		23	B	
14	01	23	11	59		14	01	08	11	53		24	C	
15	02	23	12	19	21	15	02	08	12	14		25	D	
16	03	23	12	40		16	03	08	12	35		26	E	
17	04	23	13	00	20	17	04	08	12	55		27	F	
18	05	23	13	21		18	05	08	13	16		28	G	S. *Simon* and St. *Jude*.
19	06	23	13	41	20	19	06	08	13	36		29	A	
20	07	23	14	00		20	07	09	13	56		30	B	
21	08	23	14	20	19	21	08	09	14	15		31	C	
22	09	24	14	39		22	09	09	14	34		1	D	*NOVEMBER.*
23	10	24	14	58	19	23	10	09	14	54		2	E	
24	11	24	15	17		24	11	10	15	13		3	F	
25	12	25	15	36	18	25	12	10	15	31		4	G	
26	13	25	15	54		26	13	10	15	55		5	A	
27	14	25	16	12	18	27	14	11	16	08		6	B	Whales Jaw, and *Me-*
28	15	26	16	30		28	15	11	16	25		7	C	(*dusa's* head, 44.
29	16	26	16	48	17	29	16	12	16	43		8	D	(N. 39. 33. N.
30	17	27	17	05		30	17	12	17	01		9	E	*Persens* side, 48. 13. N.
31	18	27	17	22		31	18	13	17	18		10	F	

November hath XXX Days.

The Prime.	The time of the New Moon.	Month Day.	Week Day.	The English Kalendar. Suns rising	Suns setting	Leap Year. ⊙ in Scorpio. 1692. Suns Place.	Suns Decli.	Diff. of Decli.	First Year. ⊙ in Scorpio. 1693. Suns Place.	Suns Decli.
	H. M.			H. M.	H. M.	D. M.	D. M.		D. M.	D. M.
		1	D	*All Saints.*		1 19	59 17 47	16	1 19	42 17 43
18	00 35	2	E	7 36	4 24	2 21	00 18 03		2 20	43 17 59
07	07 46	3	F	7 37	4 23	3 22	00 18 19	16	3 21	44 18 15
		4	G	K. *William* N.		4 23	01 18 34		4 22	44 18 30
15	09 18	5	A	*Powder Plot.*		5 24	01 18 50	15	5 23	45 18 45
04	18 20	6	B	7 42	4 18	6 25	02 19 04		6 24	46 19 00
		7	C	7 44	4 16	7 26	03 19 19	14	7 25	46 19 15
	01 26	8	D	7 45	4 15	8 27	04 19 33		8 26	47 19 29
01	12 26	9	E	7 47	4 13	9 28	04 19 47	14	9 27	48 19 43
09	14 42	10	F	7 48	4 12	10 29	05 20 00		10 28	49 19 57
		11	G	7 49	4 11	11 ♐	06 20 14	13	11 29	49 20 10
17	12 54	12	A	Sun in Sagit.		12 01	07 20 26		12 ♐	50 20 23
		13	B	7 52	4 08	13 02	08 20 39	12	13 01	51 20 35
06	05 16	14	C	7 53	4 07	14 03	08 20 51		14 02	52 20 47
14	20 16	15	D	7 55	4 05	15 04	09 21 02	11	15 03	53 20 59
		16	E	7 56	4 04	16 05	10 21 13		16 04	54 21 10
03	02 09	17	F	Q. *Elizabeth.*		17 06	11 21 24	11	17 05	55 21 21
	15 22	18	G	7 58	4 02	18 07	12 21 34		18 06	56 21 32
		19	A	7 59	4 01	19 08	13 21 44	10	19 07	57 21 42
19	07 30	20	B	8 00	4 00	20 09	14 21 54		20 08	58 21 51
		21	C	8 01	3 59	21 10	15 22 03	09	21 09	59 22 01
08	02 13	22	D	8 02	3 58	22 11	16 22 12		22 10	00 22 09
		23	E	Clement.	59	23 12	17 22 20	08	23 11	01 22 18
16	08 38	24	F	8 04	3 56	24 13	18 22 28		24 12	02 22 26
05	15 07	25	G	S. *Katheri.*	55	25 14	19 22 35	07	25 13	03 22 33
	02 58	26	A	8 06	3 54	26 15	20 22 42		26 14	04 22 40
02	21 48	27	B	8 07	3 53	27 16	21 22 49	06	27 15	05 22 47
		28	G	8 08	3 52	28 17	23 22 55		28 16	06 22 53
10	13 40	29	D	8 09	3 51	29 18	24 23 00	05	29 17	07 22 59
		30	E	St. *Andr. Apo.*		30 19	25 23 05		30 18	08 23 04

November.

1699	Second Year. ☉ in Scorpio. Suns Place. D.	M.	Suns Decli. D.	M.	Diff. of Decl.	1695	Third Year. ☉ in Scorpio. Suns Place. D.	M.	Suns Decli. D.	M.	South Declination increasing.	THE Foreign Account. And The Southing of the Stars just at Midnight.	
1	19	28	17	38	16	1	19	13	17	34		11 G	
2	20	28	17	55		2	20	14	17	51		12 A	
3	21	29	18	11	16	3	21	14	18	07		13 B	
4	22	30	18	26		4	22	15	18	23		14 C	
5	23	30	18	42	15	5	23	15	18	38		15 D	
6	24	31	18	57		6	24	16	18	53		16 E	
7	25	32	19	12	14	7	25	17	19	08		17 F	
8	26	32	19	26		8	26	18	19	22		18 G	(N.
9	27	33	19	40	14	9	27	18	19	37		19 A	*Perſeus* Foot, 30.52.
10	28	34	19	54		10	28	19	19	50		20 B	
11	29	35	20	07	13	11	29	20	20	04		21 C	
12	♐	35	20	20		12	♐	20	20	17		22 D	
13	01	36	20	32	12	13	01	22	20	29		23 E	
14	02	37	20	44		14	02	22	20	41		24 E	
15	03	38	20	56	11	15	03	23	21	53		25 G	
16	04	39	21	08		16	04	24	21	05		26 A	
17	05	40	21	19	11	17	05	25	21	16		27 B	
18	06	41	21	29		18	06	26	21	27		28 C	Bulls Eye, 15.47.N.
19	07	42	21	39	10	19	07	27	21	37		29 D	
20	08	43	21	49		20	08	28	22	47		30 E	S. *Andrew* Apoſtle.
21	09	44	21	58	09	21	09	29	22	56		1 F	*DECEMBER.*
22	10	45	22	07		22	10	30	22	05		2 G	
23	11	46	22	16	08	23	11	31	22	14		3 A	
24	12	47	22	24		24	12	32	22	22		4 B	
25	13	48	22	31	07	25	13	33	22	30		5 C	The Goat, 45.36.N.
26	14	45	22	39		26	14	34	22	37		6 D	
27	15	50	22	45	06	27	15	35	22	44		7 E	*Orion*'s Foot, 8.37.S.
28	16	51	22	52		28	16	36	22	50		8 E	
29	17	52	22	57	05	29	17	37	22	56		9 G	*Orion*'s firſt ſhoulder,
30	18	53	23	03		30	18	39	23	01		10 A	(06.00.N.

December hath XXXI Days.

The Prime.	The time of the New Moon.	Month Day.	Week Day.	The English Kalendar.	Last Year. ☉ in Sagittarius.				Diff. of Decl.	First Year. ☉ in Sagittarius.			
				Suns rising	Suns setting	1598	Suns Place	Suns Decli.		1599	Suns Place	Suns Decli.	
	H. M.			H. M.	H. M.		D. M.	D. M.			D. M.	D. M.	
		1	F	8 10	3 50	1	20 26	23 09	04	1	20 09	23 08	
18	01 11												
		2	G	8 11	3 49	2	21 27	23 13		2	21 11	23 12	
		3	A	8 11	3 49	3	22 28	23 17		3	22 12	23 16	
07	02 04												
		4	B	8 12	3 48	4	23 30	23 20		4	23 13	23 19	
15	21 02												
		5	C	8 12	3 48	5	24 31	23 23	03	5	24 14	23 22	
		6	D	8 12	3 48	6	25 32	23 25		6	25 15	23 25	
04	04 42												
	14 16	7	E	8 12	3 49	7	26 33	23 27	02	7	26 17	23 27	
		8	F	Con. B. V. M.		8	27 34	23 29		8	27 18	23 28	
		9	G	8 13	3 47	9	28 36	23 29		9	28 19	23 29	
01	01 54												
		10	A	8 13	3 47	10	29 37	23 30		10	29 20	23 30	
09	20 42												
		11	B	Shortest day.		11	♑ 38	23 30	1	11	♑ 21	23 30	
		12	C	Sun in Capri.		12	01 39	23 29		12	01 23	23 30	
17	06 58												
		13	D	8 13	3 47	13	02 40	23 28	01	13	02 24	23 29	
06	20 14												
		14	E	8 13	3 47	14	03 42	23 27		14	03 25	23 28	
		15	F	8 13	3 47	15	04 43	23 25	02	15	04 26	23 26	
	05 27												
		16	G	8 12	3 48	16	05 44	23 23		16	05 28	23 23	
14	11 17												
		17	A	8 12	3 48	17	06 45	23 20	03	17	06 29	23 20	
03													
		18	B	8 12	3 48	18	07 47	23 16		18	07 30	23 17	
	08 52												
		19	C	8 11	3 49	19	08 48	23 13	04	19	08 31	23 14	
		20	D	8 11	3 49	20	09 49	23 08		20	09 33	23 10	
19	02 44												
		21	E	S. Thomas Ap.		21	10 50	23 04	05	21	10 34	23 05	
		22	F	8 10	3 50	22	11 52	23 00	05	22	11 35	23 00	
08	09 26												
		23	G	8 09	3 51	23	12 53	22 55	06	23	12 36	22 54	
16	22 30												
		24	A	8 09	3 51	24	13 54	22 47		24	13 37	22 48	
05	28 15												
		25	B	Christ's Nat.		25	14 55	22 40	07	25	14 39	22 42	
	14 32												
		26	C	S. Stephen Ma.		26	15 57	22 33		26	15 40	22 35	
		27	D	S. John Evan.		27	16 58	22 26	08	27	16 41	22 28	
02	01 55												
		28	E	Innocents.		28	17 59	22 18		28	17 42	22 20	
		29	F	8 04	3 56	29	19 00	22 09	09	29	18 44	22 12	
10	18 08												
		30	G	8 03	3 57	30	20 01	22 01		30	19 45	21 03	
18	03 07												
		31	A	8 02	3 58	31	21 03	21 52		31	20 46	21 54	

December.

Second Year. ⊙ in Sagittarius.				Third Year. ⊙ in Sagittarius.					THE Foreign Account. And The Southing of the Stars just at Midnight.		
1694.	Suns Place.	Suns Decli.	Diff. of Decl.	1695.	Suns Place.	Suns Decli.					
	D. M.	D. M.			D. M.	D. M.					
1	19 55	23 07	05	1	19 40	23 05	South Declination increasing.	11	B	First in *Orion*'s girdle
2	20 56	23 11		2	20 41	23 10		12	C	(0. 35. S.
3	21 57	23 15	04	3	21 42	23 14		13	D	
4	22 58	23 19		4	22 43	23 18		14	E	(der, 44. 52. N.
5	23 59	23 22	03	5	23 44	23 21		15	F	The Wagoners shoul-
6	25 00	23 24		6	24 46	23 24		16	G	*Orion*'s right shoulder,
7	26 02	23 26		7	25 47	23 26		17	A	(07. 18. N.
8	27 03	23 28		8	26 48	23 28		18	B	
9	28 04	23 29		9	27 49	23 29		19	C	
10	29 05	23 30		10	28 50	23 30		20	D	
11	♑ 07	23 30		11	29 52	23 30		21	E	S. *Thomas* Apostle.
12	01 08	23 30		12	♑ 53	23 30		22	F	
13	02 09	23 29	01	13	01 54	23 29		23	G	
14	03 10	23 28		14	02 55	23 28		24	A	*Pollux* Foot, 16. 39 N.
15	04 11	23 26	02	15	03 57	23 27	South Declination decreasing.	25	B	*Christ*'s *Nativity.*
16	05 13	23 24		16	04 58	23 25		26	C	S. *Stephen Martyr,*
17	06 14	23 21	03	17	05 59	23 22		27	D	S. *John* Evangelist.
18	07 15	23 18		18	07 00	23 19		28	E	*Innocents.* The great
19	08 16	23 15	04	19	08 02	23 16		29	F	(Dog, 16. 13. S.
20	09 18	23 11		20	09 03	23 12		30	G	
21	10 19	23 06		21	10 04	23 07		31	A	
22	11 20	23 01	05	22	11 05	23 02		1	B	JANUARY.
23	12 21	22 56		23	12 07	22 57		2	C	
24	13 23	22 50	06	24	13 08	22 51		3	D	
25	14 24	22 44		25	14 09	22 45		4	E	
26	15 25	22 37	07	26	15 10	22 39		5	F	*Twelfth Day.*
27	16 26	22 30		27	16 11	22 31		6	G	(2. 34. N.
28	17 27	22 22	08	28	17 13	22 24		7	A	First head of ♊ *Caster,*
29	18 29	22 14		29	18 14	22 16		8	B	
30	19 30	22 05	09	30	19 15	22 07		9	C	The little dog, 6. 5. N.
31	20 31	21 56		31	20 16	21 59		10	D	a head of ♊, 8. 48. N.

A Table of the Sun's Declination for every Degree of the Ecliptick.

Degrees	♈ ♒ D.	M.	S.	♉ ♍ D.	M.	S.	♊ ♎ D.	M.	S.	Degrees
0	00	00	00	11	30	58	20	13	48	30
1	00	22	57	11	51	02	20	16	23	29
2	00	47	54	12	12	54	20	38	45	28
3	01	11	51	12	33	35	20	50	25	27
4	01	35	46	12	54	06	21	01	51	26
5	01	59	39	13	14	22	21	12	55	25
6	02	23	31	13	34	25	21	23	35	24
7	02	47	21	13	54	14	21	23	50	23
8	03	11	08	14	13	50	21	43	42	22
9	03	34	52	14	33	11	21	53	10	21
10	03	38	33	14	51	18	22	02	13	20
11	04	22	11	15	11	10	22	10	51	19
12	04	45	45	15	29	46	22	19	06	18
13	05	09	13	15	48	09	22	26	51	17
14	05	32	36	16	06	11	22	34	13	16
15	05	55	55	16	23	58	22	41	09	15
16	06	19	08	16	41	30	22	47	49	14
17	06	42	15	16	58	46	22	53	44	13
18	07	05	15	17	15	42	22	59	21	12
19	07	28	05	17	32	18	23	05	32	11
20	07	50	56	17	48	38	23	09	17	10
21	08	13	37	18	04	40	23	13	35	9
22	08	36	05	18	20	21	23	17	27	8
23	08	58	33	18	35	43	23	20	51	7
24	09	20	48	18	50	46	23	23	48	6
25	09	42	54	19	05	28	23	26	18	5
26	10	04	50	19	19	51	23	28	21	4
27	10	26	38	19	33	52	23	29	57	3
28	10	48	16	19	47	32	23	31	05	2
29	11	09	43	20	00	50	23	31	46	1
30	11	30	58	20	14	47	23	32	00	0
	♍			♌			♋			
	♓			♑			♏			

The Use of this Table of the Sun's Declination.

THE Sun's greateſt Declin. according to the obſervation of *Tycho Brahe*, and Mr. *Edw. Wright*, is 23 d. 31 m. 30 ſec. and ſo it was in their times; but later Obſervers have found it in ſomewhat more, ſo that it amounts to in theſe times 23 d. 32 m. or very little leſs; and therefore I have calculated this Table to 23 deg. 32 min. for thoſe which ſhall deſire ſo much exactneſs.

The uſe of this Table is thus: if you would know the Decli. of the Sun in any deg. and min. of the Ecliptick; Firſt, mark whether the Sign be at the head or foot of the Table: if the Sign be at the top of the Table, then count the deg. of the Sign downward in the firſt Column of the Table; but if the Sign be at the foot of the Table, then count the deg. upward, and in the laſt Column of the Table, and in the common Angle, where the Character of the Sign and deg. thereof meets, you ſhall have the Sun's Decli. in d. m. and ſec. And here note, if the place of the Sun have both deg. and min. you muſt ſee what is the Difference of the Declination between the two next deg. and by proportion allow for the odd minutes.

Thus

Thus for Example.

The Sun's place being 10 degrees of ♉ or ♍, you see the Characters of ♉ or ♍ are at the top of the Table; therefore find out 10 in the first Column, and in the same Line under ♉, you shall find 14, 52, 18, that is 14 Degrees, 52 Minutes, 18 Seconds for the Declination.

But if you would know the Sun's Declination, being in 10 Degrees of ♑ or ♒, then because the Characters are at the bottom of the Table, you must count the Degrees upward in the last Column, and so against 10 Degrees you shall find 17 Degrees 48 Minutes 38 Seconds, for the Sun's Declination.

But if the Sun were in 18 Degrees 15 Minutes of ♉, first you see by the Table, that the 18 Deg. of ♉, hath 17 Deg. 15 Min. 42 Sec. for its Declination; and the 19 Deg. hath 17 Deg. 32 Min. 18 Sec. for its Declination; the difference between them is 16 Min. 32 Sec. Then to find out by the Rule of Proportion, how much to allow for the 15 Min. say, If 16 Min. give 16 and 36 Sec. what shall 15 Min. have? and you shall find 4 Min. 9 Sec. Then consider by the order of the Table, whether this be to be added or subtracted. In this Example, it is to be added to the foresaid 17 Deg. 15 Min. 42 Sec. and so the Sun's Declination will be 17 Deg. 19 Min. 51 Sec.

After this manner you may try the Tables of the Sun's Declination in the *Ephemerides*; or if need be, you may rectify them for the time to come. But in ordinary Occasions you may leave out the Seconds, unless they be more than 30, and then you may add one to the Minutes for them.

The Use and Explanation of the former Ephemerides.

THese Tables are calculated only for 4 Years, and neither more or less, because the Leap-year is so contrived to regulate the Sun's Course, that every fifth Year the Sun returns to the same place it was before, without any sensible Error for many Years together. So that these Tables may very well serve for 20 Years to come, only observing the Order of the Years from the Leap-year, and taking that Section in the *Kalendar* which belongs unto them.

And that these Tables may last the better and the longer, I have calculated them now somewhat forwarder than they should

be; they being exactly calculated for the Years 1692, 1693, 1694, 1695, by which means they will ſerve for the next 16 Years, (*viz.*) from 1692, to 1711, without any allowance. For there will not be above 4 or 5 Minutes difference in the Sun's place more or leſs, any time theſe 16 Years; which makes but a Minute and a half difference in the Sun's Declination (even where the Declination is ſwifteſt) and ſo can breed no Error of danger to the Sea-man in his Obſervations.

But if you will be ſo exact, that you may the better know what Years theſe four Sections of the *Ephemerides* belong unto, and the Minutes which you muſt add or ſubtract to the Longitude of the Sun, to make theſe Tables more exact herein, obſerve this Table; but I would wiſh you not to correct the Declination at all, but rather let it alone as it is, leſt, for want of Skill and Heed, you make it worſe; unleſs you do it according to Art by the Table of Declinations at the end of the *Ephemerides*.

Leap-year	First,	Second,	Third,	
1692	1693	1694	1695	2 Add
1696	1697	1698	1699	2 Add
1700	1701	1702	1703	4 Sub.
1704	1705	1706	1707	
1708	1709	1710	1711	

To find the Longitude and Declination of the Sun at any time by theſe Tables.

First, Conſider whether it be the firſt, ſecond, or third Year after the Leap-year, (which you may know by the Table at the beginning of the *Ephemerides*, or in this little Table) and accordingly look down that Section which belongs thereunto, and in the Month propoſed, juſt againſt the day of the Month, you ſhall have your deſire.

For Example.

If you would know the Place and Declination of the Sun the 12*th* day of *April*, 1695: Firſt you muſt note the Year 1695, is one of the third Years from the Leap-year, and therefore you muſt look down in that Section for the Day of the Month, and now if

if you turn to the Month of *April*, against the 21st day of that Month in the aforesaid Section, you shall find that the Longitude of the Sun is 2 Deg. 23 Min. of *Taurus*, and the Declination of the Sun is 12 Deg. 19 Min. of North Declination. And this is the Place and Declination of the Sun not only this day of the Year, but also all the other Years which are joined with it in the former Table 1695, 1699, 1703, without any sensible difference, especially in the Declination, which is the thing most necessary for the Sea-man's use.

And thus with much facility you may know the true Longitude and Declination of the Sun at any time, which is of very great use for the finding of the Latitude of any place, and in working most other Conclusions of the Sphere; as you shall see more in its place.

To know the time of the Moon's Change, Full, and Quarters.

TO know the Day and Hour of the Conjunction and Change of the Moon, first look into the first Page of the *Ephemerides*, and right against the Date of the Year you shall find the *Prime* or *Golden Number*, which you must remember, and also the *Sunday Letter* for that Year; then turn to the Month in which you would know the Change of the Moon, and look out the *Prime Number* in the first Column, and by it in the second Column you shall have the Change in Hours and Minutes, which Hours and Minutes you must always reckon after Noon; then in the third Column, you shall have the day of the Month, and by the fourth you may know the day of the Week.

For Example.

Anno 1685, I would know the time of the New Moon in *July*: In the first Page of the *Kalendar*, I find that the *Prime* is 4, and the *Sunday* Letter *D*, then I turn to the Month of *July*, and I find out the *Prime* 4 in the first Column, and it stands just against the 21st day, which by the *Sunday* Letter you may see is *Wednesday*; now for the time of the Change this day, in the second Column you find 9 Hours 22 Min. which you must always reckon to be before Noon. So that in the Year 1685, it is New Moon the 21st day of *July*, being *Wednesday*, at 9 of the Clock and 22 Minutes before noon.

Here you must note, that if the Hours and Minutes of the Change be above 12, then the Change is the next day in the Morning, according to ordinary account; but this way is altogether used by the

the Astronomers, who begin the Day at Noon, and after a little use by this Table you may readily understand it. For first——— 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 hours at Noon, is the common reckoning. Then,

13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, is all one with 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 next Morning.

Or else subtract 12 Hours from the Number, and the Remainder is the time of the day next Morning.

Thus the same year 1685, the Prime being 14 in the Month of *May*, the Moon will change the 28*th* day, at 18 Hours one Minute Afternoon, that is, at 6 of the Clock one Minute next Morning, on the 23*d* day, being *Saturday*.

And thus you may find the time of the Quarters and full Moon by having the New Moon.

If you add these	day.	hr.	min.
For the first Quarter,	7	9	11
For the full Moon,	14	18	22
For the last Quarter,	22	3	33
And the whole time from Moon to Moon, is	29	12	44

Thus you shall have the Change of the Moon and Quarters, according to her equal Motion, which will be best, considering the following Conclusions, though it differ a few hours from the time of the New Moon.

To know what Sign the Moon is in.

TO this purpose you must remember, that the twelve Signs are thus numbred by Astrologers.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*,
0 1 2 3 4 5
Libra, *Scorpio*, *Sagittarius*, *Capricorn*, *Aquarius*, *Pisces*.
6 7 8 9 10 11

Now at the Change, the Sun and Moon are both in one Sign and Degree, which in the former Example of the New Moon the 12*th* of *June*, is 1 Deg. of *Cancer*; for that is the place of the Sun, according to the *Ephemerides*, the which you must set down thus, ——3 Sign, 1 Degree, 0 Minute.

A Table shewing the Moon's Motion in Signs, Degr. and Min. for every Day and Hour of her Age.

The Days of the Moon's Age.	S.	D.	M.	The Hours of the Moon's Age.	D.	M.
1	0	13	11	1	0	33
2	0	26	21	2	1	06
3	1	09	32	3	1	39
4	1	22	42	4	2	12
5	2	05	53	5	2	45
6	2	19	03	6	3	18
7	3	02	14	7	3	51
8	3	15	25	8	4	24
9	3	28	35	9	4	56
10	4	11	46	10	5	29
11	4	24	56	11	6	02
12	5	08	07	12	6	35
13	5	21	18	13	7	08
14	6	04	28	14	7	41
15	6	17	39	15	8	14
16	7	00	49	16	8	47
17	7	14	00	17	9	20
18	7	27	11	18	9	53
19	8	10	21	19	10	26
20	8	23	32	20	10	59
21	9	00	42	21	11	32
22	9	19	53	22	12	05
23	10	03	03	23	12	38
24	10	16	14	24	13	11
25	10	29	25			
26	11	12	35			
27	11	29	46			
28	0	08	56			
29	0	22	07			
30						

NOW by this Table, knowing the Age of the Moon since the Change, you may see how much must be added to the place of the Moon that she then was in, and if it shall come to more Signs than 12, you must cast 12 away, and that which remains, will shew the Sign, Degree, and Minute the Moon is in.

For Example:

Suppose you would know the Moon's Place the *19th* of *June*, at Noon, *Anno* 1675; the Change was the *12th* day, at 8 Hours at Night. Therefore the *19th* day at Noon, the Moon is 6 Days 16 Hours old.

Now the place of the Sun and Moon at the Change was, as was shewed before,

	Sig.	Deg.	M.
	3	01	0
The Moon's Motion for 6 Days, is —	2	19	3
And for 16 Hours, —	0	08	47
The Sum is	5	28	50

That is, in 28 Degrees 50 Minutes of *Virgo*.

Or else you may multiply the Moon's Age by 2, and divide the Product by 5, and the Quotient will shew you how many Signs, and the Remainder so many times six Degrees as the Moon is gone from that Sign and Degree, where the Sun is at that present time.

A Table shewing the time of the Moon's coming to the South by her Age.

The Days of the Moon's Age.	H.	M.		The Hours of the Moon's Age.	M.
1	0	49	Afternoon.	1	2
2	1	38		2	4
3	2	26		3	6
4	3	15		4	8
5	4	03		5	10
6	4	58		6	12
7	5	41		7	14
8	6	30		8	16
9	7	19		9	18
10	8	08		10	20
11	8	56		11	22
12	9	45		12	24
13	10	34		13	26
14	11	23		14	28
15	12	11		15	30
16				16	32
17	1	10	Morning.	17	34
18	1	49		18	36
19	2	38		19	38
20	3	26		20	40
21	4	15		21	43
22	5	03		22	45
23	5	53		23	47
24	6	41		24	49
25	7	30			
26	8	19			
27	9	08			
28	9	59			
29	10	45			
30	11	34			

The use of this Table is such.

KNowing as before, the time of the New Moon, you may easily know her Age any day at Noon in Days and Hours.

Then see what time is allowed for the Days, and after for the odd Hours, and add them together. Lastly, See how many Minutes are to be allowed for the time, and the sum of all will be the time of the Moon's coming to the South.

For Example.

Suppose the Moon be any day at Noon 10 Days and 8 Hours old, the Table will shew first,

For the 10 Days 8 Hours 8 Minutes.
For 8 Hours 0 16
Which is 8 24.
Now 8 Hours 24 Minutes require 0 17

All which is the time 8. 41 of the Moon's coming to the South.

Or else you may do this by the Instrument, *Page* 12, thus: Turn the moveable Circle, so that the Age of the Moon may be upon the North or South Point of the Compass, and the *Index* will shew the time of the Moon's coming to the South.

Or else by *Arithmetick*: multiply the Moon's Age by 12, and divide the Product by 15, so the Quotient will shew the Hour of the Moon's coming to the South; and if any thing remain, multiply it by 4, and that will shew the Minutes to be added to the Hours of the Quotient, and so you shall have the time of the Moon's coming to the South.

This knowledg of the Moon's coming to the South, is very necessary for many Purposes. For first, hereby you may know the time of High-tide at any place, as is shewed before.

Secondly,

2*ly*. Knowing the time of the Moon's coming to the S. you may know the time of the night by the ſhining of the *Moon* upon a Sun-Dial. Thus:

Obſerve by a Sun-Dial, as if you would ſee what a Clock it were by the *Moon*, and obſerve how much the ſhadow of the *Moon* doth either lack or is paſt the 12 upon the Dial: for ſo much it doth want of, or is paſt the time of the *Moon*'s coming to the South.

For Example.

Suppoſe as before, the *Moon* did come to the South at 8 hours 41 min. Afternoon; and the ſhadow of the *Moon* upon the Dial were at 10. this wants 2 hours of 12; and therefore it wants 2 hou. of 8 hours 41 min. ſo that it is 6 of the Clock and 40 min. But if the ſhadow of the *Moon* had been at 2 upon the Dial, then you muſt have added 2 hours to the *Moon*'s coming to the South, & ſo it had been 10 hours 41 min. at night.

Again, by the time of the *Moon*'s coming to the South, and the place of the *Moon* in the *Zodiack*, you may know the time of the *Moon*'s riſing and ſetting, as thus; Knowing what *Sign* and Degree the *Moon* is in, as before, look out when the Sun is in that Sign and Degree in the *Ephemerides*, and right againſt it in the proper Column, you ſhall find the time of the Sun's ſetting, when the Sun is in that Sign and Degree, this time is half the Diurnal Arch belonging to that Sign and Degree of the *Ecliptick*, which being added to the time of the *Moon*'s being *South*, it will ſhew the time of the *Moon*'s ſetting; and if you ſubtract it from the *Moon*'s being *South*, it will ſhew her riſing. *For Example.*

Suppoſe the *Moon* be in 10 deg. of *Taurus*, and the time of her coming to the *S.* at 10 of the Cl. at night. Firſt, I look when the Sun is in 10 deg. of *Taurus*, and that is the 20 of *April*, and the time of the Sun-ſet that day is 7 hours 18 min. this added to 10 hours, the time of the *Moon* s being *South*, is 17 hours 18 min. which is 5 of the Clock and 18 min. next *Morning*, for the time of the *Moon*'s ſetting; likewiſe, this ſubtracted from 10 hours, there remains 2 hours 42 min. the time of the *Moon*'s riſing.

To find the length of the Day and Night.

In the fifth Column of the *Kalendar* (among the fixed *Feaſts*) you have the time of the *Sun*'s riſing and ſetting, by which you may know the length of the Day and Night: for the Hours and Minutes of the Sun's riſing being doubled, gives the length of the Night, and the hours and minutes of the Sun's ſetting being doubled gives the length of the day.

How to uſe the Sun's Declination, thereby to find out the Elevation of the Pole.

TO find out the Alt. or Height of the Pole in any ſeveral Lat. *viz.* How much your Pole is raiſed above your Horizon in deg. and min. It is neceſſary, firſt, to take by Obſervation the Merid. Alt. of the Sun, which

Merid. Alt. is known by taking the height of the Sun that day, in which you would obſerve juſt at Noon, at which time the Sun is higheſt, being then alſo upon the Meridian; which found, note it down in Paper or Slate: then knowing the Year of our Lord, with the Month in which you are, and alſo the day of the Mon. look in the *Kalendar* before ſpoken of, for the Mon. and Day thereof, and right againſt the ſaid Day of the Month toward the right-hand, under the title *Sun's Dec.* you ſhall ſee the ſeveral years which the ſaid Table of Declin. ſerves for. If it be Leap-year, look in the laſt of the ſaid 4 Tables, under the title *Leap-year*. If it be the firſt after Leap-year, then reſort to the firſt of the ſaid Tables under the title *Firſt*, and ſo of the ſecond and third, and after theſe 4 years are paſt, come back again to the firſt, and proceed as you did before; then having found out the Month, Day and Year, direct your Eye down toward the foot of the Table, in the Table which ſerves for the Year propoſed, till you find a Number making a right Angle with the day of your Month or more plainly, look what Number in the laſt Col. of your Year is right againſt the Day of your Mon. which Numbers are the Decl. for the day deſired; and there being 2 Numbers in the ſaid Col. the firſt are deg. the other min. then regard alſo whether the Sun hath North decl. or S. decl. which is ſet down between the ſeveral ſpaces: Where by the way you ſhall note, that from the Sun's entrance into *Aries*, which is about the 11*th* of *March*. till his entrance into *Libra*, which is about the 13*th* of *Septemb.* He hath North Dec. and from the ſaid 13*th* of *Septemb.* till his entrance into *Aries* again, South Decli. the ſaid Dec. increaſing according to the Sun's progreſs thro the Signs from his entrance into *Aries*, till his entrance into *Cancer*, add decreaſing from *Cancer*, to the beginning of *Libra*, then increaſing from *Libra* to *Capricorn*, and decreaſing from *Capricorn* to the end of *Piſces*, and beginning of *Aries*, *Taurus*, *Gemini*, *Cancer*, *Leo*, and *Virgo*, be Signs having North Dec. from the Equinoctial Circle: and *Libra*, *Scorp.* *Sag.* *Cap.* *Aqu.* and *Piſces*. Signs having South Dec. from the Circle: Then knowing (as I have ſaid) the Merid. Alt. of the Sun, the Dec. of the Sun, and whether the Sun hath South or North Declination; as theſe three things are always to be conſidered in knowing the height of the Pole. If the Dec. be North, ſubſtract the Dec. from the Mer. Altit. the Remainder is the Elevation of the Interſection, or cutting of the Equinoctial with the Merid. above the Horizon; which in common terms, is the Elevation of the Equinoctial above the Horizon, which height of the Equinoctial taken from 90, leaveth the height of the Pole, at the Latit. of the place of your Obſervation. But contrariwiſe, if the Sun hath South Dec. add the ſaid Dec. to the Merid. Altit. the Product is the height of the Equinoctial, which likewiſe taken from 90, leaveth the height of the Pole.

Example.

Example.

I obſerve the 11*th* of *June*, 1660. in the City of *London*, and found the Meridian Altitude of the Sun to be 62 deg. and the declination of the Sun N. 23 deg. 32 min. Now being that the Declin. was North, I ſubtracted it from the height of the Sun at Noon; the Remainder was 38 deg. 28 min. the height of the Equinoctial; that taken from 93, leaves 51 deg. 32. min. for the height of the Pole, or Latitude of *London*.

This Rule is to be underſtood when you are between the Equin. and the N. Pole, and the Sun to the Southwards of you: But if you ſhould be between the Equin. and the S. Pole, and the Sun North from you, then you muſt work contrary; for then if the Sun hath S. Dec. you muſt ſubtract the Declination from the Meridian Altitude; and if the Sun hath North Declination, you muſt add the ſaid Declination the Merid. Altitude.

As for Example.

Being at Sea to the Southwards of the Line the 4*th* of *Jan.* 1676. ſuppoſe you obſerve the height of the Sun at Noon, and find it to be 66 deg. 24 min. then you ſhall find the Decl. to be 21 deg. 18 min. to the Southwards, which ſubtracted from 66 deg. 24 min. the Merid. Alt. leaves 45 deg. 6 min. for the height of the Equinoctial: That taken from 90, reſt 44 deg. 54 min. for the height of the South-Pole above the Horizon.

Again, Suppoſe that being at Sea the 10*th* of *May*, 1676. and obſerving the *Sun*, you take the Altitude at Noon 60 deg. 30 min. and his Declin. then is 20 deg. 15 min. Northwards, but then not having obſerved long before you know not whether you are to the Northwards of the Equin. or to the *Southwards* of the Line: To know which, ſet the Sun by your Compaſs, and mark which way the *Shadow* of the Sun ſtreeketh; for if he caueth his *Shadow* the ſame way that the Decl. is, then is the *Sun* betwixt the Equinoctial and you, your ſelf being alſo the ſame way that the Sun's Decl. is, and therefore ſubtracting the Decl. 20 deg. 14 min. from 60 deg. 30 min. the Merid. Alt. reſts 40 deg. 16. min. the height of the Equin. the Complement whereof 49 deg. 44 min. is the Elevation of the North-Pole: But if the *Sun* caſts his *Shadow* contrary to his Declinat. that is to ſay, it having North-Declinat. his Shadow goeth *Southward*; or having *South*-Declination, it caſts his *Shadow* Northwards: Then either the Equinoctial ſhall be betwixt you and the *Sun*, or you in the Equinoctial; or elſe you ſhall be betwixt the Equin. and the *Sun*: Which to know, add the Declin. and the Merid. Alt. for the day propoſed together: If the ſumm of the Addition be leſs than 90 deg. ſo much as it wanteth of 90 deg. ſhall you be diſtant from the Equinoctial that way that the *Shadow* ſtreeketh: If it be juſt 90 deg. then are you under the Equinoctial. Again, if your ſaid Meridian Altitude and Declination

added, passeth 90 deg. then so much as is overplus, you shall be from the Equinoctial towards the Sun, and then also shall you be between the Equinoctial and the Sun; and if you find the Sun to be in your *Zenith*, so much as is the Declination, shall you be from the Equinoctial that way that the Sun declineth: By which reason if the Sun be in your *Zenith*, that is 90 deg high, and hath no declination, then are you under the Equinoctial.

How to appropriate the Tables of Declination to any other Meridian.

THere is in the oft using of the Sun s Declination, one principal thing to be considered, which is, that a Table of Decli. made for any particular place, doth not serve generally for all places, but only for such places as have the like, or near the same Longit. The reason is, because that the Declin. is calculated according to the true place of the Sun at Noon, at which time the Sun is upon the Merid. at the place for which the said Tables are made: but you must note, that the Sun doth not come to the Merid. in all places at a like time, although that in all places the Sun being upon the Merid. makes the middle of that day. But for every 15 deg. difference of Long. between any 2 places, the Sun comes sooner or later to the Meridian, by so many hours. So that if a place be 15 deg. to the Eastward of the place prefixed, then the Sun comes sooner to the Merid. by an hour; and if it be 15 deg. to the Westwards, later by an hour. And so consequently more or less, according to the difference of Longitude. By which reason, in what part of the World soever you be, you may work for the Declination of the Sun in that place by the proportional parts of 24 hours Declination to the hours of the difference in Longitude. *Example.*

Being in *Brasilia* (a part of the *West-Indies*) the 10*th* of *April*, 1660. whose Meridian is distant from the Meridian of *England* to the Westward about 45 deg. which is 3 hours of time, that the Sun should come to the Meridian later there than at *London* where the Table is made: For when it is 12 a Clock here, it is but 9 there; and being Noon there, it is 3 a clock here. Therefore to apply this Table to that place, I find the Dec. for the day aforesaid, under one Merid. to be a 11 deg. 55 min. at Noon, and by reason that when it is 12 a Clock in *Brasilia*, it is then at *London* 3 h. past. Therefore by the Rule of proportion, I seek what Dec. the Sun hath at 3 a Clock in the Afternoon, as followeth; I take the difference of the Dec. between the day aforesaid, and the next following, which is 20 min. then I say, by the Rule of 3, if 24 hours give 20 min. what gives 3 hours, the time of the difference in Longitude? *Facit* 2 min. and 30 sec. which (because the Decl. increases) I add to the number of the day proposed: So I conclude, the Declination of the Sun to be the 10*th* of *April* at Noon in the Kingdom of *Brasilia*, 11 deg. 57 min. and a half.

Again

Again, The Day and Time aforesaid in the Bay of St. *Sebastian*, whose Longitude is 58 Degrees to the Eastward of *London*, answering near to four hours of time, shewing that the Sun comes sooner to the Meridian in the Bay of St. *Sebastian* by 4 hours, than at *London*; by which reason the Declination is less there than at *London*, because the Declination doth increase; for if the Declination did increase, it would be more there than at *London*: and to know the Declination of the Sun in the Bay aforesaid, I take the difference betwixt the Declination of the 10*th* of *April*, and the *D*eclination of the day next before, being 20 Minutes. Then (I say) if 24 hours give 20 minutes, what 4 hours? *Facit* 3 minutes 20 seconds, which deducted from 11 degrees 55 minutes, the *D*eclination of the *S*un the 10*th* of *April* aforesaid at *London*, leaves 11 degrees 51 minutes 40 seconds. The *D*eclination of the *S*un at Noon in the Bay of *St. Sebastian*, being that when it is 12 of the Clock there, it is but 8 a Clock at *London*, or in any place having the same Longitude: Because this appropriating of the *D*eclination to any other Meridian, is so necessary: I have first in the *Kalendar* set down the daily difference of the *D*eclination between the two Sections in either Page, which will differently serve for both; and I have also added this Table of *Proportion*, for your more ready finding how much you must add to, or subtract from the *D*eclination in the *Kalendar*. The work is the same as in the former Example, only this Table will save you a labour in working by the Rule of Three, and so needs no farther Example.

A Table to proportion the Sun's Declination to any time of the Day, or to any other Meridian: The daily difference of the Declination being,

The Hours from the Noon, or difference of Meridian, E. or W.	Minutes.	2	4	6	8	10	12	14	16	18	20	22	24
		″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
1		0 5	0 10	0 15	0 20	0 25	0 30	0 35	0 40	0 45	0 50	0 55	1 00
3		0 10	0 20	0 30	0 40	0 50	1 00	1 10	1 20	1 30	1 40	1 50	2 00
4		0 15	0 30	0 45	1 00	1 15	1 30	1 45	2 00	2 15	2 30	2 45	3 00
2		0 20	0 40	1 00	1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00
5		0 25	0 50	1 15	1 40	2 05	2 30	2 55	3 20	3 45	4 10	4 35	5 00
6		0 30	1 00	1 30	2 00	2 30	3 00	3 30	4 00	4 30	5 00	5 30	6 00
7		0 35	1 10	1 45	2 20	2 55	3 30	3 65	4 40	5 15	5 50	6 25	7 00
8		0 40	1 20	2 00	2 40	3 20	4 00	4 40	5 20	6 00	6 40	7 20	8 00
9		0 45	1 30	2 15	3 00	3 45	4 30	5 15	6 00	6 45	7 30	8 15	9 00
10		0 50	1 40	2 30	3 20	4 10	5 00	5 50	6 40	7 30	8 20	9 10	10 00
11		0 55	1 50	2 45	3 40	4 35	5 30	6 25	7 20	8 15	9 10	10 05	11 00
12		1 00	2 00	3 00	4 00	5 00	6 00	7 00	8 00	9 00	10 00	11 00	12 00

How to observe the height of the Pole by the Stars.

THE working thereof by the *Stars* to find the height of the Pole, is all alike with the working thereof by the *Sun*; for if you observe any *Star* upon the Meridian, look in the Table of fixed *Stars* for the name of the *Star* which you observed, where you shall find his Declination, either North or *South*, and the right Ascension thereof in degrees and hundred parts, and having taken the Altitude of any *Star* upon the Meridian, you have nothing to mark in the Table of this, but the Declination, which if it be North, take the Declination of the Star from the height thereof: The remainder taken from 90, leaveth the height of the Pole: But if the *Star* hath *South* Declination, add the Declination to the Altitude taken, and the Product thereof taken from 90, leaves the height of the Pole. Also to find the time of any *Stars* coming to the Meridian, is set down after the Tables of the *Sun*'s right Ascension; but for the first day of every Month, you have it in the Table of the *Stars*.

Example.

The 25*th* of *November*, I observed a *Star* of the second bigness in the Wing of *Pegasus*, or the *Flying-horse*, about 8 of the Clock in the Evening, and found the Meridian Altitude thereof to be 51 deg. 52 min. and in the Table of the fixed *Stars*, I find the said *Star* to have 13 deg. 24 min. North-Declination: which taken from 51 deg. 45 min. the height observed, leaves 38 deg. 28 min. the height of the Equinoctial, the Complement whereof 51 deg. 32 min. is the height of the North-Pole at *London*.

And consequently for all those *Stars*, whose Declination is taken from the Equinoctial: But for those *Stars* which are any thing near to the Pole, whose Distance or Declination is counted from the Pole, their working is thus: You must note, that that being far to the Northwards, some of those *Stars* will be twice upon the Meridian, *viz.* Once above the Pole, and once under the Pole: Therefore if you observe any *Star* upon the Meridian under the Pole, and the distance of the said *Star* from the Pole to your Altitude observed, the total is the height of the Pole: But if you observe any *Star* upon the Meridian above the Pole, so much as is the distance or declination of the said *Star* from the Pole, you must take from the Altitude taken, the remainder is the height of the Pole.

As for Example.

If at *London* you observe the former *Guard Star* beneath the Pole upon the Meridian, you shall find it to be 37 deg. 16 min. to which if you

add

add 14 deg. 22 min. the distance of the said Star from the Pole, the total is 51 deg. 32 min. the height of the North-Pole at *London*. Again, the same Star observed upon the Meridian above the Pole, is 65 deg. 54 min. from which 14 deg. 22 min. the distance aforesaid taken, leaveth 51 deg. 31 min. as before.

Note, That being far Northward, those Stars between the Equinoctial and Tropick of *Cancer* are best to observe; and being between the said Tropick and the said Equinoctial, those Stars above the Pole are fitted for Observation; and for those that travel far beyond the Line to the Southward, the like order must be kept by the Stars between the Equinoctial, and the Tropick or *Capricorn*, and those that are near the South Pole.

Of the North-Star.

WHereas the North Star being very near the Pole, and (by report) is of most Sea-men made use of for Observation in our Northern Navigation, considering the great use that hath been made thereof, there hath formerly been 2 Tables set forth for this purpose, the one after a more general way, as supposing little or no difference in any Latitude; the other with some allowance for the difference of the height of this Star in several Latitudes; whichthough it be not much, for it is but 3 min. in the Lat. of 40 deg. and but 4 min. in the Latitude of 50 deg. and but 6 min. in the Latitude of 60 deg. (which is as far as these Observations can well be used) yet this difference is not to be neglected, and therefore here I have joyned both the Tables in one, having corrected them according to the true Declination of this Star from the Pole, for the year 1660, which is 2 deg. 30 min.

But herein take special notice, how you must reckon these Points of Compass, which in the old Tables were not well directed, for they reckon the Points of the Compass upon their Nocturnals, just as they are in the Figures of the Compass, *Page* 12. which though it shows the true Position of them, as it lies flat, yet is very false and absurd when the Instrument is held up for Observation.

Therefore in this Table, I begin at that part of the Meridian which lies directly under the Pole, which may most probably be called the North, and so proceed point by point, as the Guard and the other Stars make their Revolution about the Pole, ascending from this lowest or North Point of the Meridian to the North-east, and so to the East, and from thence to the South-east, and so to the South or highest Point of their ascending, being directed over the Pole: From this South or highest Point

they

they deſcend again by the Weſt, and ſo return to the North again. Yet becauſe ſome have ſcrupled hereat, being uſed to the other way, I have alſo in the laſt Column ſet the Points of the Compaſs according to the old way, ſo that you may uſe which you find beſt.

Laſtly, Take this as a general Uſe to guide you, and to prevent Miſtakes, that the firſt of the Guards of the little Bear which is in the Star you are to obſerve, is almoſt in oppoſition to the Pole-Star: ſo that when the Guard-Star is under the Pole, then the Pole-Star is above the Pole; and when the Guard-Star is above the Pole, then the Pole-Star is under the Pole ſo many deg. and min. as the Table ſhews you.

The uſe of the Table is thus: When you would obſerve the Altitude of the North-Star, mark as near as you may (or rather obſerve with a Nocturnal made on purpoſe) upon what Point of the Compaſs the former Guard of the little Bear is (reckoning the Points of the Compaſs thereon, according to the foreſaid Rules) and if the ſaid Star be not juſt upon a full Point of the Compaſs, then ſtay a little longer, till it come to ſome of of them, and then obſerve the height of the Pole-Star as exactly as you can. Then by the way of your Ship, knowing within a deg. or 2 what Latitude you are in, conſider which of theſe Latitudes ſet down in the top of your Table, in that which you are neareſt to, and uſe that. And now if you find the Point of the Compaſs which the Guard-Star is upon in the firſt Column of the Table, in that very Line under the Column of your Latitude, you ſhall find how many deg. and min. the Pole-Star is either above or below the Pole; according to the direction of the laſt Column of the Table, which you make uſe of. If the Star be any thing above the Pole, ſubtract the number in the Table, from the height of the Star obſerved: but if the Star be under the Pole, then add the number found in the Table to the height obſerved, and ſo you ſhall have the true height of the Pole.

Thus (if without having any reſpect to the Latitude) you ſhall ſee the Guard-Star to the juſt North-eaſt from the Pole-Star, and by obſervation find the height thereof to be 50 deg. 00 min. look out this Point North-eaſt in the Table, and againſt it in the next Column marked (0 Lat.) you ſhall find that the Star is 0 deg. 39 min. above the Pole, and this now ſubtracted from the foreſaid height 50 deg. there reſts 49 deg. 21 min. for the height of the Pole.

But if you will be more exact, and have reſpect to the Latitude which you are in, which you may ſuppoſe to be about 50 deg. then look in this Line of North-eaſt for the Column under 50, and there you ſhall find that the Pole-Star is only 35 min. above the Pole, and this ſubtracted from

the

the aforesaid height of 50 deg. shews the true Latitude to be 49 deg. 25 min. which differs 4 min. from the former; and is so much the more exact.

But if the Guard-Star had been South-west, then the Pole-Star had been 30 min. or (more exactly) 44 min. under the Pole, which being added to the height 50 deg. the Latitude should be 50 deg. 30 min. or more exactly 50 degrees 44 minutes.

And now having made plain unto you the Use and Profit of the said Table, it being indeed so necessary and commodious for the Mariners Use as any Rule whatsoever: It resteth now to speak somewhat more particularly of the other fixed Stars, set down in the Table following, wherein are in the first Page 12 Columns, the first is the Number of the Stars, which are 65; the second is their Names; the third is their magnitude, either the first, second or third *Magnitudes*; the fourth is their *Right Ascension* in Degrees and hundred Parts; the fifth is the *Difference* of their *Right Ascension* for an hundred years; the sixth is their *Declination* in degrees and minutes; the seventh is the name of their *Declination*, *S* signifying *South*, and *N* signifying *North*; the eighth is the *Difference* of their *Declinations* for an hundred years; the ninth sheweth whether their Difference of Declination be to be added or subtracted, *A* signifying to add, and *S* to subtract; in the tenth their *Right Ascension* in Hours, and hundred parts, for knowing the Hour of the Night at any time. In the two last Columns, and so along over the second Page at the top of the Column, are the Names of the 12 Months, and under them in the Columns of every Month are the Hours, and hundred parts of an Hour, that any of these Stars come to the Meridian the first Day of every Month: the letter *M* shews the Hour to be between Midnight and Noon; and the letter *N* sheweth the Hour to be between Noon and Midnight. Next after the Table of the *Stars*, follows a Table of the Complement of the Sun's *Right Ascension* in Hours and hundred parts; the Use of which Table follows after the Table.

A Table of the North Star.

In these several Latitudes.

The true Point of the Compass.		0 D.M.	20 D.M.	30 D.M.	40 D.M.	50 D.M.	60 D.M.	70 D.M.	Of Declina.	The old way of reckoning the Point of the Compass.
If the former of the Guards be ascending from the North or lower Part of the Meridian.	North.	2 10	2 10	2 10	2 09	2 09	2 08	2 07	Above the Pole.	South.
	N by E	1 53	1 53	1 53	1 52	1 55	1 51	1 49		S by E
	N N E	1 31	1 31	1 30	1 30	1 29	1 28	1 25		S S E
	NEbyN	1 06	1 05	1 04	1 03	1 02	1 01	0 58		S E by S
	N E	0 39	0 37	0 36	0 36	0 35	0 33	0 30		S E
	NE by E	0 10	0 09	0 08	0 07	0 06	0 04	0 01		S E by E
	E N E	0 18	0 19	0 20	0 21	0 22	0 23	0 26	Under the Pole.	E S E
	E by N	0 49	0 50	0 50	0 51	0 52	0 53	0 56		E by S
	East.	1 15	1 15	1 16	1 17	1 18	1 19	1 21		East.
	E by. S	1 38	1 39	1 39	1 40	1 41	1 42	1 44		E by N
	E S E	2 00	2 00	2 00	2 00	2 01	2 02	2 02		E N E
	S E by E	2 15	2 15	2 15	2 15	2 16	2 16	2 16		N E by E
	S E	2 25	2 25	2 25	2 25	2 25	2 25	2 25		N E
	S E by S	2 30	2 30	2 30	2 30	2 30	2 30	2 30		NE by N
	S S E	2 29	2 29	2 29	2 29	2 29	2 29	2 29		N N E
	S by E	2 22	2 22	2 22	2 22	2 22	2 22	2 22		N by E
If the former of the Guards be descending from the South or upper Parts of the Meridian.	South.	2 10	2 70	2 10	2 11	2 11	2 11	2 12	Above the Pole.	North.
	S by W	1 58	1 53	1 54	1 53	1 35	1 55	1 57		N by W
	S S W	1 31	1 32	1 32	1 33	1 34	1 35	1 38		N N W
	S W by S	1 07	1 07	1 08	1 10	1 10	1 11	1 13		NW bN
	S W	0 39	0 40	0 41	0 40	0 43	0 47	0 44		N W
	SWb W	0 10	0 11	0 12	0 13	0 14	0 19	0 16		NWbW
	W S W	0 19	0 18	0 17	0 16	0 15	0 13	0 10		W N W
	W by S	0 48	0 47	0 46	0 45	0 44	0 43	0 42		W by N
	West.	1 15	1 14	1 13	1 12	1 11	1 10	1 08		West.
	W by N	1 39	1 39	1 38	1 37	1 36	1 35	1 33		W by S
	W N W	2 00	1 59	1 59	1 58	1 58	1 57	1 56		W S W
	NWbW	2 15	2 15	2 14	2 14	2 14	2 13	2 12		SW bW
	N W	2 25	2 25	2 25	2 25	2 25	2 24	2 24		SW
	NWb N	2 30	2 30	2 30	2 30	2 30	2 30	2 30		S W by S
	N N W	2 29	2 29	2 29	2 29	2 29	2 29	2 29		S S W
	Nby W	2 22	2 22	2 20	2 20	2 22	2 21	2 21		S by W

Fixed Stars and their coming to the South the first day of *Right Ascension* and *Declination* for 100 Years.

Number.	For the Year 1660. *Names.*	Magnitude.	Right Ascension.	Diff. 100 year.	Declination.	North or South	Diff. 100 year.	Right ascension.	January.	February.
			D. pts.	d. pt.	D. M.		M	H. pts.	H. pts.	H. pts.
									A	A
1	North in Whales tail.	3	00 60	1 30	10 41	S	34	S 0 04	4 48	2 36
2	South in Whales tail.	2	06 62	1 27	19 51	S	34	S 0 44	4 88	2 44
3	Pole Star. (Girdle.	2	08 19	1 82	87 30	N	34	A 0 55	4 90	2 76
4	South in *Andromeda's*	2	12 67	1 39	33 50	N	33	A 0 84	5 29	3 15
5	In *Cassiopia's* knee.	3	16 02	1 58	58 27	N	33	A 1 07	5 50	3 36
6	South in Rams horn.	3	23 77	1 38	17 38	N	31	A 1 58	6 03	3 88
7	North in Rams horn.	3	23 98	1 37	19 09	N	31	A 1 60	6 03	3 89
8	Rams head.	3	27 07	1 42	21 51	N	30	A 1 80	6 28	4 09
9	Brightest in Whales jaw.	2	41 17	1 25	02 44	N	29	A 2 75	7 18	5 04
10	Head of *Medusa.*	2	42 60	1 61	39 37	N	29	A 2 77	7 21	5 07
11	*Perseus* right side.	2	44 92	1 47	48 35	N	28	A 2 99	7 45	5 29
12	After in *Perseus* left foot.	3	53 29	1 57	30 52	N	26	A 3 55	7 99	6 85
13	Bulls Eye.	1	64 15	1 45	15 47	N	10	A 4 28	8 71	6 57
14	The Goat *Hircus.*	1	72 75	1 81	45 56	N	10	A 4 85	9 29	7 15
15	*Orions* left foot.	1	74 62	1 25	08 37	S	09	S 4 97	9 40	7 26
16	*Orions* left shoulder.	2	76 77	1 35	06 00	N	07	A 5 12	9 55	7 41
17	First in *Orions* Girdle.	2	78 78	1 28	00 85	S	09	S 5 25	9 66	7 52
18	Wagons right shoulder.	2	83 82	1 92	64 52	N	08	A 5 59	10 39	8 22
19	*Orions* right shoulder.	2	84 27	1 37	07 18	N	04	A 5 62	10 07	8 91
20	Brightest in *Pollux* feet.	1	94 52	1 47	26 39	N	02	S 6 30	10 74	8 60
21	Great Dog. (*Castor.*	1	97 95	1 18	26 23	S	04	A 6 50	10 94	8 80
22	First head of *Gemini*	2	108 20	1 74	32 34	N	11	S 7 21	11 65	8 51
23	Little Dog.	1	110 42	1 35	06 05	N	12	S 7 36	11 80	8 66

The *Right Ascension* and *Declination* of 65 of the principal
every Month, with the Difference of their

Mar.		April		May.		June.		July.		Aug.		Sept.		Octo.		Nov.		Dec.		Number.
H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	
A		M		M		M		M		M		M		A		A		A		
0	57	10	69	8	81	6	72	4	65	2	62	0	72	10	91	8	92	6	78	1
0	97	11	09	11	09	7	12	5	05	3	02	1	12	11	31	9	32	7	18	2
0	99	11	11	11	21	7	14	5	09	3	04	1	14	11	53	9	34	7	20	3
1	38	11	50	11	50	7	53	5	46	3	43	1	53	11	33	9	73	7	59	4
1	59	11	71	11	71	7	74	5	67	3	64	1	74	11	93	9	97	7	80	5
		A												M						
2	11	0	23	10	35	8	26	6	19	4	16	2	26	0	46	10	46	8	32	6
2	12	0	24	10	36	8	27	6	20	4	17	2	27	0	46	10	47	8	33	7
2	32	0	44	10	56	8	47	6	40	4	37	2	47	0	66	10	69	8	53	8
2	87	0	99	11	01	8	42	7	33	5	32	3	42	1	61	11	62	9	48	9
3	30	1	42	11	54	9	45	7	38	5	35	3	45	1	64	11	65	9	51	10
3	82	1	64	11	76	9	67	7	60	5	57	3	67	1	86	11	67	9	73	11
				A												M				
4	08	2	20	0	32	10	23	8	16	6	13	4	23	2	42	0	43	10	29	12
4	80	2	92	1	04	10	95	8	88	6	87	4	95	3	14	1	15	11	01	13
5	38	3	50	1	62	10	53	9	46	7	43	5	53	3	72	1	73	11	59	14
5	40	3	61	1	73	11	64	9	57	7	54	5	64	3	83	1	84	11	70	15
5	54	3	73	1	88	11	79	9	72	7	69	5	79	3	98	1	99	11	85	16
5	87	3	87	1	99	11	90	9	83	7	80	5	90	4	09	2	10	11	96	17
6	44	4	56	2	68	0	59	10	52	8	49	6	59	4	78	2	79	0	65	18
6	14	4	26	2	38	0	29	10	22	8	19	6	39	4	48	2	49	0	35	19
6	83	4	95	3	07	0	96	10	98	8	88	6	58	4	17	3	18	1	04	20
7	08	5	19	3	27	1	18	11	08	9	08	7	18	5	37	3	38	1	24	21
7	74	6	80	3	98	1	89	11	82	9	79	7	89	6	08	4	09	1	91	24
7	8	6	01	4	13	2	04	11	97	9	94	8	09	6	23	4	42	2	10	23

Fixed Stars, and their coming to the South the first day of *Right Ascension* and *Declination* for 100 Years.

Number.	For the Year 1660. *Names.*	Magnitude.	Right Ascension. D.	pts.	Diff. 100 year. d.	pt.	Declination. D.	M.	N or S	Diff. 100 year.	M	Right ascension. H.	pts.	January. H.	pts.	February. H.	pts.
														A		A	
24	Second head *Gem. Castor*	2	111	17	1	59	28	48	N	12	S	7	41	11	84	9	77
														M			
25	Southern Arm, the Crab	3	129	97	1	39	13	8	N	22	S	8	95	1	10	10	96
56	*Hydra*'s heart.	1	137	77	1	25	7	12	S	25	A	9	18	1	62	11	46
27	Lion's heart.	1	147	59	1	37	13	36	N	25	S	9	84	2	27	0	13
28	Lion's neck, highest.	2	149	43	1	47	25	5	N	29	S	9	96	2	35	0	21
29	Great Bear's side.	2	160	16	1	62	58	19	N	32	S	10	68	3	11	0	97
30	Great Bear's back.	2	160	64	1	67	63	35	N	33	S	10	71	3	14	1	00
31	Lion's back.	2	164	03	1	45	22	22	N	34	S	10	94	3	36	1	22
32	Lion's tail.	1	172	95	1	33	16	28	N	34	S	11	53	3	97	1	83
33	Great Bear's thigh.	2	173	85	1	38	55	36	N	34	S	11	60	4	3	1	89
34	First in Raven's wing.	3	179	88	1	3	15	37	S	34	A	11	99	4	43	2	19
35	First in great Bear's tail.	2	189	72	1	15	57	50	N	34	S	12	65	5	9	2	95
36	Virgin's spike.	1	196	87	1	32	9	21	S	33	A	1	12	5	56	3	42
37	Sec. in great Bear's tail.	2	197	54	1	4	56	44	N	33	S	1	17	5	61	3	47
38	Thir. in great Bear's tail.	2	203	52	1	3	51	3	N	30	S	1	57	6	1	3	87
39	*Centaur*'s right shoulder.	3	206	73	1	48	35	16	S	30	A	1	78	6	22	4	8
40	Arcturus.	1	210	10	1	20	21	20	N	30	S	2	1	6	45	4	31
41	South Ballance.	2	218	08	1	39	14	34	S	27	S	2	64	6	97	4	83
42	Foremost Guard.	3	223	83	1	17	15	38	N	5	S	2	85	7	32	5	18
43	North Ballance.	2	224	74	1	35	8	5	S	24	A	2	98	7	37	5	23
44	Brightest North Crown.	2	230	08	1	7	27	33	N	35	S	3	34	7	78	5	64

The *Right Ascension* and *Declination* of 65 of the principal
every Month, with the Difference of their

Mar.		April.		May.		June.		July.		Aug.		Sept.		Octo		Nov.		Dec.		Numb.
H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	
	A		A		A		A		A		M		M		M		M		M	
7	39	6	05	4	17	2	08	0	01	9	98	8	08	6	27	4	28	2	34	24
9	19	7	21	7	43	3	24	1	27	11	24	9	34	7	53	5	54	3	40	25
9	78	7	83	7	95	3	86	1	75	11	76	9	86	8	05	6	06	3	92	26
											A									
10	36	8	38	8	60	4	31	2	44	0	41	10	51	8	79	6	71	4	57	27
10	44	8	56	8	68	4	39	2	52	0	49	10	59	8	78	6	79	4	65	28
11	26	9	32	8	44	5	35	3	28	1	25	11	35	9	54	7	55	5	41	29
11	23	9	35	7	47	5	38	3	31	1	28	11	38	9	57	7	58	5	44	30
11	41	9	67	7	89	5	60	3	53	1	50	11	60	9	79	7	80	5	66	31
	M												A							
0	88	10	10	8	30	6	21	4	14	2	11	0	21	10	20	8	42	6	28	32
0	12	10	24	8	56	6	29	4	22	2	17	0	27	10	26	8	47	6	33	33
0	32	10	64	8	76	6	67	4	66	2	57	0	67	10	86	8	87	6	73	34
1	18	11	30	9	42	7	33	5	26	3	23	0	33	11	52	9	53	7	39	35
1	65	11	77	9	89	7	80	5	73	3	70	1	80	11	99	10	00	7	86	36
															A					
1	70	11	82	9	94	7	85	5	78	3	75	1	85	0	04	10	05	7	92	37
			M																	
2	10	0	22	10	34	8	25	6	18	4	15	2	25	0	44	10	45	8	32	38
2	31	0	43	10	55	8	46	6	39	4	36	2	46	0	65	10	66	8	53	39
2	54	0	66	10	78	8	69	6	62	4	59	2	69	0	88	10	89	8	75	40
3	06	1	18	11	30	9	21	7	14	5	11	3	21	1	40	11	41	9	27	41
3	41	1	53	11	65	9	56	7	49	5	46	3	[illegible]	1	75	11	76	9	62	42
3	46	1	58	11	70	9	61	7	54	5	51	3	61	1	80	11	81	9	67	43
					M												A			
3	87	1	99	00	11	10	02	7	95	5	[illegible]	3	54	2	21	10	22	10	08	44

Fixed Stars, and their coming to the South the first day of *Right Ascension* and *Declination* for 100 Years.

Number.	For the Year 1660. *Names.*	Magnitude.	Right Ascension.	Diff. 100 year.	Declination.	N or S	Diff. 100 year.	Right ascension.	January.	February.
			D. pts	d. pr.	D. M.		M	H. pts.	H. pts.	H. pts.
									M.	A.
45	Brightest of Serp. neck.	2	281 30	1 25	07 33	N	21	3 46	3 01	8 77
46	Hinder Guard, *Subi.*	2	283 22	0 30	73 16	N	20	3 42	3 87	5 73
47	Scorpion's heart.	1	242 33	1 55	25 36	S	16	4 15	5 58	5 44
48	Serpentarius right knee.	3	259 76	0 82	16 13	S	10	4 82	4 29	5 15
49	Hercules head.	2	254	1 12	14 30	N	08	4 90	4 43	5 29
									A.	
50	Sagittarius Arrow-head	3	266 22	1 62	30 00	S	02	5 75	10 18	8 04
51	Dragons-head.	3	269 21	0 82	51 26	N	04	5 81	10 26	8 12
52	The Harp.	1	276 32	0 58	38 20	N	04	6 48	10 87	8 73
53	Swans Bill.	3	289 25	1 03	27 17	N	12	7 29	11 73	8 56
54	Sagittarius left thigh.	3	293 30	1 67	35 22	S	14	7 57	11 00	9 86
									A	
55	Vultures heart, *Alkair.*	3	293 58	1 28	08 02	N	14	7 57	0 01	9 87
56	Swans tail.	2	309 48	0 86	44 90	N	20	8 58	0 94	10 80
57	Dolphins head.	3	307 76	1 16	14 67	N	21	8 58	0 96	10 82
58	Pegasus mouth.	3	321 95	1 30	08 21	N	26	9 46	1 90	11 76
59	Last in tail, *Capricorn.*	3	322 12	1 61	17 35	S	27	9 48	2 91	11 77
									M	
60	Fomalhaut.	1	339 62	1 42	31 20	S	31	10 64	3 08	0 49
61	Pegasus right shoulder.	2	341 87	1 20	26 15	N	32	10 79	3 96	1 09
62	Pegasus wing. (*Scheat.*)	2	342 60	1 16	13 24	N	32	10 80	3 24	1 40
63	Head of *Andromeda.*	2	357 70	1 25	27 14	N	34	11 85	4 20	2 15
64	Britest *Cassiopia's* chain.	2	357 83	1 27	57 18	N	35	11 86	4 20	2 16
65	Pegasus wing tip *Scheat.*	2	359 00	1 27	13 18	N	35	11 92	4 39	2 25

The *Right Ascension* and *Declination* of 65 of the principal
every Month, with the Difference of their

Mar.		April.		May.		June.		July		Aug.		Sept.		Octo.		Nov.		Dec.		Number.
H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	
	M		M		M		A		A		A		A		A		A		M	
4	00	2	12	0	24	10	15	8	08	6	05	4	15	2	34	0	35	10	21	45
4	56	2	08	0	29	10	11	8	04	6	01	4	11	2	30	0	31	10	17	46
4	67	2	79	0	91	10	82	8	75	6	72	4	82	3	01	1	02	10	88	47
5	38	3	50	0	62	11	53	9	46	7	44	5	54	3	72	1	73	11	59	48
5	52	3	64	0	76	11	67	9	60	7	58	5	68	3	86	1	87	11	73	49
						M													A	
6	27	4	39	2	51	0	42	10	35	8	32	6	42	4	62	2	62	0	48	50
6	35	4	47	2	59	0	50	10	43	8	40	6	50	4	68	2	70	0	56	51
6	96	5	08	3	20	1	11	11	04	9	01	7	11	5	30	3	31	1	17	52
7	81	5	93	4	06	1	97	11	90	9	87	7	97	6	16	4	17	2	03	53
								M												
8	05	6	33	4	33	2	24	0	17	10	14	8	24	6	43	4	44	2	30	54
8	10	6	21	4	34	2	25	0	18	10	15	8	25	6	44	4	45	2	31	55
9	03	7	15	5	27	3	18	1	11	11	08	9	18	73	37	5	38	3	14	56
9	05	7	17	5	29	3	20	1	13	11	10	9	28	7	39	5	40	3	26	57
										M										
0	99	8	11	6	23	4	14	2	07	0	04	10	14	8	33	6	44	4	20	58
0	00	8	12	6	24	4	15	2	08	0	05	10	15	8	34	6	35	4	21	59
11	17	9	29	7	41	5	32	3	25	1	22	11	32	9	11	7	53	5	38	60
11	32	9	44	7	56	5	47	3	40	1	32	11	20	9	66	7	67	5	53	61
11	33	9	45	7	57	5	48	3	41	1	38	11	48	9	67	7	68	5	54	62
	A												M							
10	38	10	50	8	62	6	53	4	46	2	43	0	53	10	72	8	73	6	53	63
10	38	10	50	8	62	6	53	4	46	2	43	0	53	10	72	8	73	6	59	64
00	40	00	50	8	74	6	63	4	56	2	53	0	63	10	82	10	83	6	67	65

A Table of the Complement of the Sun's right Ascension for every day at Midnight, in Hours and hundred Parts.

Days.	Janua. H.	pts.	Febr. H.	pts.	March. H.	pts.	April. H.	pts.	May. H.	pts.	June. H.	pts.
1	4	40	2	27	0	50	10	62	8	73	6	64
2	4	33	2	21	0	44	10	56	8	67	6	57
3	4	26	2	14	0	37	10	49	8	60	6	50
4	4	18	2	08	0	31	10	43	8	54	6	43
5	4	11	2	01	0	25	10	37	8	47	6	36
6	4	05	1	95	0	19	10	31	8	40	6	29
7	3	98	1	88	0	13	10	25	8	34	6	23
8	3	90	1	82	0	07	10	19	8	27	6	16
9	3	83	1	79	0	01	10	12	8	21	6	09
10	3	76	1	69	11	95	10	06	8	14	6	02
11	3	69	1	63	11	89	10	00	8	07	5	95
12	3	63	1	56	11	83	9	94	8	01	5	88
13	3	55	1	50	11	77	9	88	7	94	5	81
14	3	48	1	44	11	71	9	81	7	87	5	74
15	3	41	1	38	11	65	9	75	7	80	5	66
16	3	33	1	31	11	59	9	69	7	64	5	60
17	3	27	1	25	11	53	9	63	7	67	5	53
18	3	20	1	19	11	47	9	56	7	60	5	46
19	3	13	1	13	11	41	9	50	7	53	5	39
20	3	07	1	06	11	35	9	44	7	57	5	33
21	3	00	1	00	11	28	9	38	7	40	5	26
22	2	93	0	94	11	22	9	31	7	33	5	19
23	2	86	0	88	11	16	9	25	7	26	5	12
24	2	79	0	82	11	10	9	18	7	20	5	05
25	2	73	0	75	11	04	9	12	7	13	4	98
26	2	66	0	69	10	98	9	06	7	07	4	91
27	2	59	0	63	10	92	8	99	6	99	4	85
28	2	53	0	57	10	86	8	93	6	92	4	78
29	2	47			10	80	8	86	6	85	4	71
30	2	39			10	74	8	80	6	78	4	64
31	2	33			10	68			6	71		

A Table of the Complement of the Sun's right Ascension for every day at Midnight, in Hours and hundred Parts.

Days	July.		August		Septem.		October		Nove.		Decem	
	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.	H.	pts.
1	4	57	2	54	0	65	10	84	8	84	6	70
2	4	51	2	48	0	59	10	78	8	77	6	72
3	4	44	2	42	0	53	10	72	8	70	6	55
4	4	37	2	36	0	47	10	65	8	63	6	48
5	4	30	2	29	0	41	10	59	8	56	6	40
6	4	24	2	23	0	35	10	53	8	49	6	33
7	4	17	2	17	0	29	10	47	8	42	6	25
8	4	10	1	11	0	23	10	40	8	35	6	18
9	4	03	1	04	0	17	10	34	8	28	6	11
10	3	97	1	98	0	11	10	28	8	23	6	03
11	3	90	1	92	0	05	10	22	8	15	5	96
12	3	84	1	86	11	99	10	15	8	08	5	88
13	3	77	1	80	11	93	10	09	8	01	5	81
14	3	70	1	74	11	89	10	02	7	93	5	73
15	3	63	1	68	11	81	9	96	7	86	5	66
16	3	57	1	61	11	75	9	90	7	71	5	59
17	3	51	1	55	11	69	9	83	7	73	5	51
18	3	44	1	49	11	63	9	77	7	65	5	44
19	3	38	1	43	11	57	9	70	7	58	5	36
20	3	31	1	37	11	51	9	67	7	50	5	29
21	3	25	1	31	11	45	9	60	7	43	5	21
22	3	18	1	25	11	39	9	51	7	36	5	14
23	3	13	1	19	11	33	9	44	7	28	5	07
24	3	05	1	13	11	27	9	37	7	21	5	99
25	2	99	1	07	11	20	9	31	7	14	5	92
26	2	92	1	01	11	14	9	24	7	07	4	85
27	2	86	0	95	11	08	9	18	6	99	4	78
28	2	80	0	89	11	02	9	11	6	92	4	70
29	2	73	0	83	10	96	9	04	6	84	4	63
30	2	67	0	77	10	90	8	98	6	77	4	55
31	2	61	0	71			8	91			4	48

A Description of the former Table of the Sun's Right Ascension.

I Think it not amiss, before I shew you the use of the former Table of *Right Ascension*, for finding the time of any Star coming to the *Meridian*, to explain unto you what we call *Right Ascension*.

Know therefore, that in the Sphere there is *Right Ascension*, *Oblique Ascension*, and *Mean Ascension*, which have all several Definitions: But the rest being impertinent, I will only speak of *Right Ascension*, which is thus defined. *Right Ascension* is that portion of the Equinoctial which cometh to the Meridian of Noon-stead with any Star, or any part of the Ecliptick: Or more plainly, It is that Number of Degrees of the Equinoctial, comprised between the Vernal Equinoctial Point or Intersection of the said Equinoctial Circle, and the first minute of *Aries*, and that Star, or part of the Ecliptick, which is upon the Meridian at the day or time desired. As for your better understanding, If the beginning of *Aries* being upon the Meridian, or any Point or Star in the said beginning of *Aries*, then hath the said Point or Star so situated no *Right Ascension* at all, by reason that the beginning of the Equinoctial cometh to the Meridian therewith. But if the beginning of *Cancer*, or any Star in that situation be upon the Meridian, then is there with it under the same Meridian 90 deg. of the Equinoctial, or 6 Hours of time, being that every 15 deg. of the Equinoctial answers to one Hour of time, shewing that the Star or Point which is in the beginning of *Aries*, shall come to the *Meridian* 6 Hours sooner than the other which is in the beginning of *Cancer*, and so others. I doubt not but that these few Words will suffice to give you the better light to that which follows. First therefore, to find the *Right Ascension* of the Sun at any time, look for the Month in the Head of the Table, and for the day of the Month at the left side of that Face where the Month desired is, and in the common Angle answering to them both, is the hour and minute of the Sun's *Right Ascension*.

The Use of the former Tables of the fixed Stars, and of the Sun's Right Ascension.

This Table of the fixed Stars is reduced from 77 Stars to 63, which yet will be no less to the Sea-men. For those Stars which are left out, are either very small, (and so not fit for Observation) or else they are such as are so far to the Southward, that they could not be observed by *Tycho*, or any of the *European Mathematicians*, whose Observations are Authentical; and by this means there is very great difference in their Accounts: As for Example, The two chiefest Stars left out are the last of *Eridanus* and *Canopus*, belonging to the Constellation of *Argo*, which

are indeed Stars of the first Magnitude, and therefore if it were possible to have their true places, they would be of good use: But seeing some account the last of *Eridanus* to be in 21 deg. 10 minutes ♈, and Latitude S. 23 deg. 30 min. and others account it in 9 deg. 45 min. ♉, and Latitude S. 59 deg. 30 min. while the truth is better known, we need not rely upon such an uncertainty, having so many other Stars fit for Observation. So likewise for *Canopus*, some reckon it to be in 8 deg. ♋, and South Latitude 75 deg. others allow it 69 deg. of Latitude.

Instead of these two, I have added to the Table a Star of the second Magnitude, in the top of the Wing of *Pegasus*, a Star so fit for Observation, that Mr. *Gunter* maketh choice of it for one of the 5 Stars to be set upon his Quadrant. And all these Stars have their allowance of *Right Ascension* and *Declination* for 100 years, by which you may rectify them in time to come. I have set down their places for the year 1660, and this Table will not need rectifying till the year 1670.

To find the time of any Star's coming to the Meridian, the first day of every Month; seek the number of the Star in the first Column of the left-hand Page, and seek the same number in the last Column of the right-hand Page, and in the same Line under the Names of the Month, you shall see the hour and hundredth part the Star comes to in the Meridian.

Example.

I do desire to know at what time the *Bull's Eye* comes to the Meridian the first day of *January*; I look in the first Column of the left-hand Page, and I find his Number 13, then I look 13 in the last Column of the right-hand Page, and right under *January* in the same Line, I find 8 hours and 71 hundred parts, and because I find the Letter *A* next over-head, I see it is Afternoon, that is 8 of the Clock at night and 71 hundred parts, which is neer three quarters of an hour, and so of all other.

Again, Here you may see by the Table what number of these Stars are in rule for Observation at any time.

Example.

I desire to know how many of these Stars are in the Rule for Observation the first of *January*. I look in the Table and I find the second Star, that is, the Southermost in the *Whale's Tail*, to come to the Meridian at 4 a Clock, and 89 parts Afternoon, that is near 5 of the Clock in the Evening, about which time the Stars begin first to appear, and so I follow on under the Month of *January*, until I come to 6 a Clock 1 part in the Morning, that is, the 38 Star, which is the third in the *Great Bear's Tail*, between which and the fourth Star, are 36 Stars that are in the Rule for Observation the first of *January*.

But that you may know the time of any Star's coming to the Meridian, and day of the Month; and that somewhat more exactly, and with more ease, than by the Rule formerly prescribed in this Book, I have in the Tables of the Stars, added the *Right Ascension* of every Star, in hours and hundred parts; and also made alteration in the Table of the Sun's *Right Ascension*, setting down the Complement of the Sun's *Right Ascension*, instead of the *Right Ascension*, which is more easy in the use of it: For this requires only *Addition*, the other *Subtraction*; and many times one may forget, and *subtract* the one instead of the other. This Table also is fitted to the time of Midnight, which is most proper, because the Stars are only visible in the night. And in the *Right Ascension* both of the Sun and Stars, I have not exceeded 12 Hours, the Account by that means being more easy; and if you know not whether the time fall out in the Evening or Morning, the Tables of the Months will direct you.

Now the Rule for the using, is thus: Add the *Right Ascension* of the Star, and the Complement of the Sun's *Right Ascension* for any Night, (as you find it in the Table) together, and the sum is the time of the Star's coming to the South; but if the sum exceeds 12, cast away 12 and take the Remainder.

Example.

The *Right Ascension* of the *Bull's Eye* is, — 4 hours 48 parts. The Complement of the Sun's *Right Ascension*, *January* 21, is 3 hours 0 parts. These two added together, make — 7 hours 48 parts, which is the time of that Star's coming to the South the 21 day of *January*, at Night, and so you must do for any other Star, at any other day.

To rectify the Right Ascension *of any of these Stars, whose difference is given, to any time within an hundred Years.*

I Desire to know the *Right Ascension* of *Orion's right-shoulder* in the year 1686, *subtract* 1660 out of 1686, the difference is 26: then say, if an 100 years give 1 degree 97 parts for the difference of *Right Ascension*, what shall 26 years give? and 100 shall find 0 degree 34 parts *fere*, which added to 84 degrees 21 parts, the *Right Ascension* of the said Star in the year 1660, the sum is 84 degrees 67 parts, the *Right Ascension* of the same Star in the year 1686, and the like of all other.

To

To rectify the Declination of any of these Stars that have the difference given, to any time within an 100 years.

Example.

IDesire to know the Declination of the Pole-Star for the year 1667, I subtract 1660 out of 1667, the difference is 7; then say, If 100 years give 34 min. for the difference of Declination (as you may see in the Table) what shall 7 years give? and you shall find 2 min. 38 parts, which is to be added, as you may see by the Letter *A* in the last Column, to 87 deg. 30 min. the Declination of the Pole-Star for the year 1660, and the whole is 87 deg. 32 min. the Declination of the Pole-Star for the year 1667. This way of rectifying the *Right Ascension* and *Declination*, I doubt not but it shall meet with some captious Censures, but I know the defect between this and Calculation cannot be so palpable as theirs in censuring: Howbeit in the mean time we may see, that the former Tables for these Stars that I have calculated must be renewed again at most in 20 years, or else Errors will be in their use.

Having sufficiently explain'd unto you the manner and way how both by the Sun and Stars to attain to the true height of the Pole, or Latitude of any place, I purpose now (God willing) to speak somewhat of the Longitude, which as the former is most easy, and the finding thereof known almost to all Sea-men, so is the other as uncertain, and hath not yet hitherto been found or known exactly to any, albeit that many Learned Men of great Experience, having laboured very earnestly for the same, and invented many good Means, as helps and assistance unto Mariners in their long Navigation and Travels, by which, though with great Labour, Care, and Industry, they transport themselves to the utmost Regions of the World; with far more ease and facility they might do it, if they could as perfectly and readily find the Longitude at all times, as they may the Latitude, for then having sailed many days in unknown Parts upon the large and spacious Seas, and endured all those intolerable Troubles, Miseries, and unspeakable Calamities, which do for the most part attend upon long Voyages; yet after all this, if upon the first fair opportunity they could readily with the Latitude find also the Longitude, their forepast Troubles would be joyfully remedied, being that these two (like loving Sisters) would apply such pleasing comfort to their cold Stomachs, after their tedious Travels, by giving them the true prick or place of their then present being: *Peter Apian*, and *Gemma Frisius* have written thereof, as also some others: but truly in my opinion it was never brought to so exquisite Perfection, as is now adays; and

for

for me to write thereof, were but as it were to set up a Candle at Noon-day, rather to shew mine own Folly than to light those that know a better way than my self; in which doing, well may *Apelles*'s saying, *Ne sutor ultra crepidam*, be applied unto me: But for my excuse, I do entreat the Judicious to perswade themselves, that it is far from my Thoughts to set down any thing in this for a Precedent unto them, but only in good will to shew my opinion thereof to the Ignorant, being as followeth.

First therefore, The Latitude being known, by finding the Longitude also, you have the true Prick or Place in the *Globe* or *Card*, where your Ship is, which to find the nearest, is two ways; one by the dead-reckoning, the other by observation; but dead-reckoning (as they call it) being as I take it, most used, I will speak first therof, by which if it were possible that this Reckoning could exactly and precisely be kept, it would give both Latitude and Longitude without any Observation at all: The different Latitude being only the distance that the Ship is departed from the Parallel where she last was, either Northward or Southward; and Longitude being the distance that she is departed from the Meridian either Eastward or Westward: For the knowledg thereof, these things are principally to be considered.

First, The true Prick or place of the Ship's being at the beginning of the Voyage.

Secondly, A sound and experimented Judgment of the way that the Ship maketh with every shift of Wind.

Thirdly, To know exactly how much the Compass doth vary from the true North or South-point, upon which the Needle is toucht either Eastward or Westward, in as many several places as conveniently may be observed

Fourthly, To note diligently the Floods or Currents, which may cause the Ship's way to be more Leeward, or otherwise than expectation, and to give allowance of her Course and way accordingly.

Fifthly, The several Points of the Compass that she makes her Course good upon, and what way she hath made upon every Point.

Sixthly, To bring those several Courses into one streight Line, thereby to know what Course she hath made good, with the nearest distance upon the said Point or Rumb that she hath made her way good upon.

And *lastly*, Knowing how many Leagues doth raise or lay a degree upon the said Rumb, and true reckoning of your said Course and Distance, gives you the difference of Latitude, or the Parallel where the Ship then is; and also knowing how many Leagues answer to a degree

of

of E. and W. in the said Parallel, the Course, Distance and Latitude gives the difference of Longitude, or the Meridian under which the Ship then is, the Intersection of which said Parallel and Meridian is the Prick or Place of the Ship's then being; of which things I wil speak more particularly afterward.

Now it resteth to speak something of knowing the Longitude only by Observation, which is very necessary to be known, that thereby the one may make trial of the other, being that if the account by dead-reckoning, and also by Observation, do both agree in the Latitude and Longitude, then you may be well assured, that you know truly the place where you then are, which Longitude by Observation, is thus known: Prepare a very perfect and true running Glass, which may precisely run 24 hours without error, and about the time that you purpose to set Sail, set the said Glass a running just at 12 a Clock, when the Sun is upon the Meridian: being run out, be sure to turn the said Glass instantly as it is out, not losing any time in the turning of it; and so having very warily kept the said Glass till you think good to make an Observation, at which time it is requisite to have in readiness an half-hour Glass and a minute-Glass, that if the 24-hour-Glass be out before the Sun comes to the Meridian, then so soon as it is out, to turn the half-hour-Glass or minute-Glass as you see occasion, thereby to know presently how much the 24-hour-Glass is out before the Sun comes to the Meridian: for if the Sun is upon the Meridian just when the 24-hour Glass is out, then you may assure your self that you hvae sailed North and South, and are still under the same Meridian you were at first; but if the 24-hour-Glass be out before the Sun comes to the Meridian, for every 4 minutes that the Glass is out before Noon, your difference of Longitude is 1 degree to the Westward, and for every hour 15 degrees.

And contrary, if the Sun comes to the Meridian before the Glass is out, then according to the same proportion of time is your difference of Longitude to the Eastward, which difference of Longitude, if you multiply by the number of Miles answerable to a Degree of Longitude in that Latitude, where you then find your self to be, the Product gives the Miles of distance, that you are either to Eastward or Westward of the Meridian that you are departed from.

The like may also be effected by any of those fixed Stars, whose true time of coming to the Meridian you know: for if the account of time precisely kept by your Glass, and the Star's coming to the Meridian, as you find in your Table of *Right Ascension*, do justly agree, then are you still under one and the same Meridian; but if the time be past by your

Account,

Account, that the ſaid Star ſhould be upon the Meridian before the Star doth come to the Meridian; for every hour that the Star comes to the Meridian after the ſaid time paſt, your difference of Longitude is 15 degrees to the Weſtward; and for every hour that the Star comes to the Meridian before, by your account of time truly kept, it ſhould be upon the Meridian, your difference of Longitude is 15 degrees to the Eaſtward.

Although the Author of this Book in his time, knew of no other means to attain the Longitude, than by ſuch as he hath here publiſhed, and by the Eclipſes which ſeldom happen; yet ſeeing it hath pleaſed God ſince his time to reveal a manifeſt way, (which cannot be ſtopped, but it will come to perfection) to attain the Longitude; I ſuppoſe it is neceſſary to ſpeak ſomething of it, becauſe it falls out ſo fit in this place.

THere are ways that are not imaginary (as ſome affirm) but real, and grounded upon certain natural Principles, as any Mathematical Concluſions whatſoever, in Geography or Navigation.

And whatſoever many may expect ſome excellent way for it from Foreign Parts, by certain ſmall Stars near *Jupiter*, and that ſome here at home would have the World conceited of a way by Celeſtial Obſervation; yet it is without doubt, the Longitude muſt be found by Obſervation made of ſomething below the Moon: for I do truly affirm, that there are Magnetical Poles, whoſe Latitude and Longitude I do as certainly know, as concurrent Obſervations and Arithmetical Calculations can diſcover them; and their Annual Motion I know, and by conſequence the time of their Revolution. It may be objected, that the Variation in many, nay in moſt places, is very irregular, and not according to ſuch Magnetick Poles as I ſpeak of; for in ſome places on the ſame Parallel in equal ſpaces, it altereth much ſwifter than in other; beſides in the Parallel of *London*, there is 2 degrees 00 Eaſterly Variation to the Eaſtwards of *London*, and 2 degrees 00 Eaſterly Variation to the Weſtwards of *London*; and yet both theſe Places are to the Eaſtwards of the firſt Meridian of the World within 45 deg. 0 min. of Longitude. It is true; but all this I can very well reſolve, and I doubt not but to do it for all places: Moreover, there are ſome places within a certain Longitude, whoſe Variations continue conſtant for hundreds of years, and yet afterwards do vary as ours here at *London* doth now; but at *London* it is never conſtant, although in former time the Variation of it was not ſenſible, it is now in its ſwifteſt motion. It were to be wiſhed (that as many noble-minded Men have been at the charge often-times to adven-

ture towards the seeking out a passage North-west into the South-Sea; that some Noble-minded would take this into consideration, or that some Noblemen furnished with convenient and exact Instruments, might make Observations to the Westwards for the more full perfection of this Work, it would make much for their lasting Fame, and for the Honour of this Kingdom. But because I am confined to a little room, I must abruptly end my Discourse of Longitude, only take notice, that those that live until the Year of our Lord 1657, shall not see any Variation at all at *London*, and afterwards it will encrease Westerly at least for 50 years.

This being written by *Mr Bond* 20 years ago, it came to pass exactly; so that in *July* 1657, it was observed there was no Variation at *London*; and now the Variation will begin to be Westerly, and will encrease Westerly about 11 minutes every year for the first 30 or 40 years, but afterwards the motion will not be so fast. The Period of the Motion is about 370 years.

Of the Variation of the Compass.

CConcerning the Variation of the Compass, it hath been very learnedly treated on by divers of our Country-men, and in our Vulgar Tongue, and namely by Mr. *Norman*, and Mr. *Burrow*, in their Books called the *New Attractive*, and *Variation* of the *Compass*: and since that, most excellently and ingeniously written of, by that rare and learned *Mathematician* of our time, Mr. *Wright*, in his Book of the *Correction of Errours in Navigation*, as also in his Translation, called the *Haven-finding-Art*: In which respect it is needless for me here to write any thing thereof, only let it suffice to speak a little thereof, and being necessary to the knowledg of the fore-going Matter, for them that would willingly note how much the Compass doth vary in several Places of their Sailing, I think it best to have the Needles of their Compass touched upon a good Stone, and so placed directly under the North-Point of the *Fly*, without allowing any Variation at all, the outward edge of the said *Fly* to be graduated to each quarter into 90 degrees, for the ready reckoning of the degrees that the Compass doth vary from the true North or South, either towards the East or the West. Over which *Fly*, it is necessary to have a round Circle of Brass, with two Sights upon the same, the one directly against the other at opposite Points, to be raised perpendicularly where occasion shall serve; which Circle with the Sights thereon, as I have said, being placed upon the Glass over the *Fly* within

within the Box where the Compaſs is, when you would obſerve the Variation of the Compaſs, juſt either at the Sun-Riſing or Setting, turn the Sight in the Braſs Circle towards the Sun, and looking through the ſame, mark preciſely how many degrees the Sun riſeth or ſetteth from the Eaſt or Weſt Point of the *Fly or Compaſs*: For if the Sun be in the Equinoctial, having then no Amplitude, ſo much as is the difference of the Sun's Riſing or ſetting from the Eaſt or Weſt Points ſhewed by the Compaſs, is the Variation of the Compaſs from the true North or South; but if the Sun be either to the Northward or Southward of the Equinoctial, having Amplitude, then is there a reſpect alſo to be had to the Sun's Amplitude: as thus, if the Sun hath North or South Amplitude, and that you obſerve the Sun to riſe or ſet ſo much from the Eaſt or Weſt Point of the Compaſs, as is the Sun's Amplitude, and likewiſe the ſame way that the Amplitude is, then hath the Compaſs no Variation: but if the Sun having North Amplitude, riſeth notwithſtanding more Northerly by your Compaſs then by the ſaid Amplitude it ſhould do, the degrees of true Amplitude deducted from the Amplitude which the Compaſs ſheweth, leaves the Variation of the Compaſs to the Eaſtwards of the North: But if the true Amplitude be greater than the Compaſs ſheweth, the one deducted from the other, leaveth the Variation to the Weſtward of the North: and if the Amplitude be Southerly, and the Compaſs ſhew the Sun to riſe Northerly, both the differences added together, gives the Variation Eaſterly: or if the Amplitude be Northerly, and the Compaſs ſheweth it to be Southerly, then both the differences added together, gives the Variation to be Weſterly. All this is to be underſtood, when you obſerve by the Amplitude *Ortivo (viz.)* at the Sun's Riſing: for if you obſerve the Setting thereof, then by adding or deducting the differences between the true Amplitude known, and the Amplitude given by the Compaſs, the total or Remainder ſhews the Compaſs to vary ſo much to the contrary ſide. An Example will make all this plain unto you, which let it be thus propoſed: Suppoſe that being at Sea you find by the Table of * *Sines* hereafter ſet down (or by ſome other means) the Sun's Amplitude at the time to be 20 degrees to the Northwards; and ſeeing the Sun at his riſing, by the Compaſs (as is before ſhewed) you find that the Sun riſeth 35 degrees to the Northward of the Eaſt, which is ſomewhat to the Northward of the North-eaſt and by Eaſt-point; therefore ſubtracting 20 degrees, the Sun's true Amplitude, from 35 degrees, the Amplitude which the Compaſs

* *See* Prop. 3. *of the uſe of Sines.*

paſs ſheweth, the Remainder being 15 degrees, ſheweth the Compaſs to be ſo much varied from the North to the Eaſtward, which is one whole Point and above ¼: Otherwiſe the Sun having the ſame Amplitude Northerly (as is aforeſaid) and ſetting him at his going down by the Compaſs, the ſaid Compaſs ſheweth him to ſet only 5 deg. to the Northward of the Weſt, which deducted from 20 degrees, the true Amplitude, leaveth 15 degrees for the Variation of the Compaſs to the Eaſtward, as before.

As for Example.

Suppoſe that the Sun having 23 degrees of South Amplitude, and the Compaſs ſheweth the Amplitude or Riſing to be 11 degrees Northerly, add 23 degrees the true Amplitude, with 11 degrees of contrary Amplitude, which the Compaſs ſheweth, and the Product 34 degrees being three whole Points, and ſomewhat more, ſheweth that the Compaſs is ſo much varied from the true North to the Eaſtward.

Again, the Sun having the ſame Amplitude Southerly, you obſerve at his Setting, and find by your Compaſs that he ſetteth 11 degrees Northerly, adding the two Amplitudes as aforeſaid, 23 and 11, the Product 34 ſheweth the Variation ſo much to the Weſtward, being that in the Obſervation at his Riſing, the Eaſt and by North Points of the Compaſs ſtand where the Eaſt South-eaſt ſhould be; and at his Setting in the other Obſervation, the Weſt and by North-Point of the Compaſs pointed to the Sun, in which place ſhould be the Weſt South-weſt Points.

Theſe few words will ſuffice, being (that albeit to the ignorant they ſeem ſomewhat dark, yet) in the Practice thereof, they ſhall find it, I doubt not, very plain and eaſy for their underſtanding: otherwiſe there are ſundry ſorts of Inſtruments to find the Variation by; but others have already written thereof: I have thought good alſo to ſhew my Opinion of this plain and eaſy way, knowing that the Mariners having made Experience of many ways, will only uſe that which they find beſt both for their Eaſe, Profit, and Truth thereof. And note, That whatſoever is here ſpoken concerning the finding the Variation by the Amplitude, the very like may be obſerved by the *Azimuth*, which by the Sun or Stars being to be ſeen, may at any time be known.

How

How many Leagues ſailing upon any Point of the Compaſs will raiſe or lay a Degree of Latitude, and what Departure from the Meridian you make thereof.

THis is ſo common in every Book, that I need not write thereof, but only being that it is a neceſſary Help to that which hath been before ſpoken of, it is not amiſs to ſet it here down, as followeth;

Firſt, Sailing South and North, you keep ſtill one Meridian: and in ſailing 20 * *Engliſh* Leagues, you either raiſe or depreſs the Pole 1 Degree. But if you ſail upon the firſt Point or Rhumb from North or South, either Eaſtward or Weſtward, you muſt ſail 20 Leagues, and one third part, to raiſe or lay one Degree of Latitude: and ſo having changed your Parallel 1 deg. you are alſo departed from your firſt Meridian 4 Leagues, the way which your Courſe was.

Upon the ſecond point or Rhumb from North to South, 21 Leagues and one third, to lay a Degree of Latitude, and your diſtance from the Meridian is 8 Leagues and one third.

Sailing upon the third Point 24 Leagues to raiſe or lay a Degree, and Diſtance from the firſt Meridian is 13 Leagues and one third..

Upon the fourth Point 28 Leagues, and one third, raiſe or lay a degree of Latitude, and diſtance from the Meridian is twenty Leagues.

Upon the fifth Point 36 Leagues, raiſe or lay a degree of Latitude, and diſtance from the Meridian is 30 Leagues.

* Here note, that although the Author hath ſet down *Engliſh* Leagues; yet it muſt be 20 ſuch Leagues as anſwer to 1 Degree of the Meridian; and therefore the Knots on the Log-Line muſt be 5 foot aſunder at leaſt, according to the late Experience made by Mr. *Richard Norwood*, which Experiment was formerly verified by Practice at Sea by Captain *Thomas James*, in his Voyage to the North-weſt, as we may ſee in the ſeventh Page of his Journal by the Courſe, Diſtance, and Latitudes from the *Blaskey* (on the Weſt of *Ireland*) to Cape *Farwell*, compared with Mr. *Norwood's* Experiment.

But becauſe many will hardly be drawn to alter their Knots from their Old Form; Therefore, if any Man will multiply 112, by the Knots run out in half a minute, the Product, cutting off two Figures to th: right-hand, ſhall be the number of the Leagues run in a Watch, according to Mr. *Norwood's* Experience.

Sailing

Sailing upon the sixth Point or Rhumb 52 Leagues and one third, raise or lay a degree, and having altered your Latitude one degree upon that Point, you are departed from the first Meridain 48 Leagues and one third.

If you sail upon the seventh Point, being the next from the East or West, you may sail 102 Leagues and two Thirds, before you raise or lay the Pole one degree, and then are you 101 Leagues from your first Meridian: But if you sail East or West, then are you still in a Parallel, and neither raise or lay the Pole at all.

To find the distance of any two Places, knowing the Longitude and Latitude of them.

IF the two Places differ only in Latitude, then are they both under one and the same Meridian: and to know the distance betwixt them in Miles or Leagues, multiply the number of the degrees of difference by 60 Miles, or 20 Leagues, the Product of which Multiplication gives the true distance between them in Miles or Leagues according as you work them, being that 60 Miles, or 20 Leagues, make 1 degree of a great Circle. But if the one place hath North Latitude, and the other South, then add both their Latitudes together, and work as aforesaid: And if both the Places are under the Equinoctial, they have then no Latitude. And there likewise 60 Miles or 20 Leagues make 1 degree, and the working like the former, if the difference be under 180 degrees. For if the difference be more than 180, subtract the said difference from 360, and multiply the Remainder by 60 or 20, as before.

These are so plain and easy, that they need no Example: But if they differ both in Longitude and Latitude, or in Longitude only in that Parallel beside the Equinoctial, the working is somewhat more difficult, by reason that the farther the Parallels are distant from the Equinoctial towards either of the Poles, the shorter they are; and the shorter the Parallels are, the fewer Miles make a Degree; so that whereas in the Equinoctial 60 Miles make 1 degree; yet in Longitude, where the Pole is raised about 52 degrees, in this Parallel 37 Miles make a Degree, and so every 37 Miles East or West in this Parallel, are so many degrees. For which purpose, I have here added a new Table shewing the Miles of distance answerable to a Degree in every several Latitude from the Equinoctial towards either of the Poles: and when you know the Miles answerable to a Degree in the Parallel desired, if the difference

ference of the two places be only in Longitude, multiply the difference of their Longitude by the number of Miles answerable to a degree, and the Product sheweth the distance in English or Italian Miles betwixt the said two places.

Example.

London and *Middlebrough* have both in a manner one Latitude, (*viz.*) about 52 deg. and I find in this Table, that in the Parallel of 52 deg. 36 miles, 84 parts, make a deg. of Longitude, the Longitude of *London* is 25 deg. 50 min. which subtracted one from another, leaves 3 deg. 50 min. for the difference of Longitude: Then multiply 3 deg. by 37 miles, the Product is 111 miles: Then for 50 min. I say by the Rule of Three, if 60 min. give 37 miles, what gives 50 minutes? *Facit* near 31 which added to 111 makes 142 miles, or 47 Leagues and a mile, for the distance between *London* and *Middlebrough*.

But if the two places differ both in Longitude and Latitude, then is the working more difficult than either of the former.

For First, You must take the difference of the two places in Longitude, and then their difference also in Latitude: then multiply the difference of Latitude of the two places by 60, and set the Product thereof by it self for the first Number: then multiply the difference of Longitude by the number of Miles answerable to each Latitude severally, and and add both the Products together: the half whereof set down for your second Number, and multiplying each of the said two Numbers into it self squarely, and both the Products together, and extracting the square Root thereof, the said square Root is the distance between the two places desired. *But*

Degrees	Miles and 100 parts in a deg.		Degrees	Miles and 100 parts in a deg.	
	M.	*pts.*		*M.*	*pts.*
01	59	99	46	41	68
02	59	96	47	40	92
03	59	92	48	40	15
04	59	85	49	39	36
05	59	77	50	38	57
06	59	67	51	37	76
07	59	55	52	36	94
08	59	42	53	36	11
09	59	26	54	35	27
10	59	09	55	34	41
11	58	91	56	33	55
12	58	69	57	32	68
13	58	46	58	30	80
14	58	22	59	30	90
15	57	96	60	29	00
16	57	67	61	28	09
17	57	38	62	27	17
18	57	06	63	26	24
19	56	73	64	25	30
20	56	38	65	24	36
21	56	01	66	23	40
22	55	62	67	22	44
23	55	23	68	21	07
24	54	81	69	20	50
25	53	38	70	19	52
26	53	93	71	18	53
27	53	46	72	17	54
28	52	98	73	16	54
29	52	48	74	15	54
30	51	96	75	14	53
31	51	43	76	13	51
32	50	88	77	12	50
33	50	32	78	11	47
34	49	74	79	10	45
35	49	15	80	09	42
36	48	54	81	08	38
37	47	92	82	07	35
38	47	28	83	06	31
39	46	63	84	05	27
40	45	96	85	04	23
41	45	28	86	03	18
42	44	59	87	02	14
43	43	88	88	01	09
44	43	16	89	00	05
45	42	43	90	00	00

But for the finding the Distance of Places, here follows an easier way, and more natural, by the Table of Sines, which will be necessary to make use of the Table of Longitude and Latitude, as also to make use of the Difference that is between the true Distance of Places as they are upon the Globe, and as most of them are laid down upon the plain Sea-Chart.

1. IF one place be under the Equinoctial, and the other have Latitude, and their difference of Longitude be 90 degrees 0 min. then their distance asunder is 90 deg. 0 min.

2. If one Place under the Equinoctial, and the other have Latitude, and their difference of Longitude be more than 90 degrees 0 min. subtract 90 degrees from it, and seek the Sine of the Remainder, and add it to 10000, and multiply the Sum by the Sine of the Complement of the Latitude of the other Place, cutting off 4 Figures to the right-hand from the Product, and from the rest subtract the Sine of the Complement of the Latitude given, and the Remainder shall be the Sine of the Complement of the distance between the two places, unto the Arch of which Sine add 90 deg. 0 min. and the whole is the distance required.

But if the Difference of Longitude be less than 90 degrees 0 min. subtract it out of 90 degrees 0 min. and seek the Sine of the Remainder, and multiply it by the Sine of the Complement of the Latitude given; cut off 4 Figures to the right-hand from the Product, and the rest is the Sine of the Complement of the distance between the two places.

3. If both places have Latitude, add one Latitude to the Complement of the other, and seek the Sine of the Sum, which Sine keep: Then if the difference of Longitude be more than 90 deg. 0 min. seek the Sine of the excess above 90 deg. 0 min. and add it to 10000, which Sum keep; but if it be less than 90 deg. 0 min. seek the Sine of the Complement of it, and subtract it from 10000, and keep the Remainder: Next multiply the Sum kept, or this Remainder, by the Sine of the Complement of one Latitude, cutting off 4 Figures to the right-hand of the Product, and the rest multiply by the Sine of the Complement of the other Latitude, cutting off 4 Figures to the right-hand of the Product, and take the difference between the last Product, and the Sine of the Sum of the Complement of this one Latitude, added to the other Latitude, which difference shall be the Sine of the Complement of the distance between the two Places.

Note,

Note, If the laſt Product be equal to the Sine of the Sum of the Complement of one Latitude added to the other Latitude, the two places are 90 deg. 0 min. diſtant aſunder; but if it be leſs than the ſaid Sine, they are leſs than 90 deg. 0 min. aſunder; but if it be more than the ſaid Sine, then the former difference is the Sine of the exceſs above 90 deg. 0 min. unto which add 90 deg 0 min. and the whole is the diſtance required.

Example of the ſecond.

The Iſland of *St. Thomas* under the Equinoctial Longitude 38 deg. 0 min. and *Java minor* Longit. 151 deg. 0 min. and Latit. 8 deg 0 min. difference of the Longitude 113 deg. 0 min. the exceſs above 90 deg. 0 min. is 23 deg. 0 min. the Sine 3908, which added to 10000, the Sum is 13908, the Complement of the Latit. given 82 deg. 0 min. the Sine is 9903, which multiplied by 13908, the Product is, cutting off 4 Figures to the right-hand, 13773, from which ſubtract 9903, the Sine of the Complement of the Latit. the Remainder is 3870, the Sine of 22 deg 46 min. unto which add 90 deg. 0 min. and the whole is 112 deg. 46 min. which multiplied by 60, and 46 min. added, 6766 miles, the diſtance of the two places.

Example of the third.

Nova Zembla Longit. 83 deg. 29 min. and Latitude 74 deg. 0 min. and *New-Plimouth* in *New-England*, Longitude 315 deg. 0 min. and Latitude 41 deg. 37 min. leſſer Latitude added to the Complement of the greater, the Sum is 57 deg. 37 min. whoſe Sine is 8445, the difference of Longitude 128 deg. 29 min. the exceſs above 90 deg. 0 min. is 38 deg. 29 min. whoſe Sine is 6223, which added to 10000, that Sum is 16223, which multiplied by 7476, the Sine of the Complement of 41 deg. 37 min. the Product is 12128, and this multiplied again by 2756, the Sine of the Complement of 74 deg. 0 min. the laſt Product is 3342, which ſubtracted from that Sine of the Sum of one Latitude, and added to the Complement of the other Latitude, *viz.* the Sine of 57 deg. 37 min. that is, 8445, and the Remainder is 5103, the Sine of 30 deg. 41 min. whoſe Complement is 59 deg. 19 min. which being multiplied by 60, makes 3559 Miles, the diſtance required.

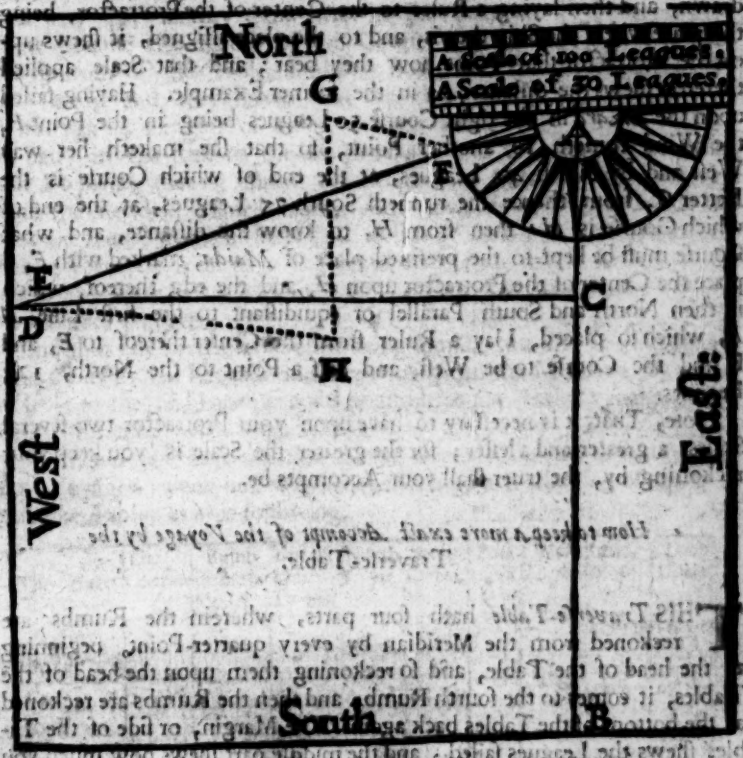
The ingenious Mariners may Sail by knowing the true Longitude and Latitude of Places, to any Place assigned, as well by a blank of Paper or Pastboard, as by his *Sea-Chart*, by the help of a Protractor.

For Example.

A Ship being at *Lizard* in the South-west parts of *England*, whose Longitude and Latitude I find in the Table to be 18 degrees 30 min. and 50 degrees 10 minutes, is bound for an Island in the Ocean Sea called *Maida*, whose Longitude I find in the same Table to be 2 degrees 40 minutes, and Latitude 46 degrees 40 minutes, the difference of their Latitude is 3 degrees 30 minutes, which is 210 miles, or 70 Leagues: Therefore from the Prick or Point *A*, I draw the Line *A B* in the *Traverse-Board* here adjoyning, and upon the Point *A* I place the Center of the Protractor, being one half of the Mariner's Compass, the middle Point whereof representing the North or South, (as occasion serves) I lay upon the Line *A B*, and applying 70 Leagues (whereof the Scale on the edge of the Protractor contains 100) from *A* towards *B*, where the said 70 ends, I make a Prick marked with *C*, so is *A C* 70 Leagues, the distance between the *Lizard* and the Parallel of *Maida*; then from *C* I draw the Line *C D* at right Angles to *A B*, and by the former Chapter, I find the distance betwixt *Maida* and the Meridian of the *Lizard* to be 629 Miles, or 209 Leagues and two Miles; which by the Scale aforesaid, applied to the Line *C D*, at the end of the distance I set a Prick marked with *E*, so is the Line *C E* 209 $\frac{1}{3}$ Leagues, the distance that *Maida* is to the Westward of the Meridian of the *Lizard*, or the Line *A B*; then the Protractor lying as at the first, I lay a Ruler from the Center thereof to the last Prick *E*, and with the former Scale measuring along by the edge of the Ruler from *A* the first Prick, to *E* the last, I find the distance to be 222 Leagues, and the Ruler cuts the Point *West* by *South*, and a half Point to the Southward; So I conclude the Ile of *Maida* to be distant from the *Lizard* 222 Leagues, and the direct Course West and by South, and half a Point Southwards.

The

The Type of a Traverse-Board *and a* Protractor.



But if the Wind be scant or contrary, so that you cannot sail by the direct Course, then you must keep a Reckoning, how many Leagues you Sail upon every Point; and where you change your Course, there place the Center of the Protractor, keeping the Meridian, or North or South-Line of the Protractor Parallel to the Meridian down on the Traverse-Board, and laying a Rule from the Center of the Protractor along that Point upon which the Ship maketh her way; and to the edge of the Ruler so placed, apply so many Leagues of the Scale, as the

Ship hath ſailed upon that Point; and then where that Number ends, ſet a Prick for the place where the Ship then is, and again upon that Prick, place the Center of the Protractor, laying as before, the South and North-Line thereof parallel to the Meridian, or South-Line firſt drawn, and then laying a Ruler to the Center of the Protractor, being the place where the Ship then is, and to the place aſſigned, it ſhews upon the Protractor that Point how they bear; and that Scale applied thereto, ſhews the diſtance, as in the former Example. Having ſailed upon the *Lizard* in the right Courſe 50 Leagues being in the Point *F*, the Wind cometh to another Point, ſo that ſhe maketh her way Weſt and by North 40 Leagues, at the end of which Courſe is the Letter *G*, from thence ſhe runneth South 75 Leagues, at the end of which Courſe is *H*: then from *H*, to know the diſtance, and what Courſe muſt be kept to the prefixed place of *Maida*, marked with *E*, I place the Center of the Protractor upon *H*, and the edg thereof, which is then North and South Parallel or equidiſtant to the firſt Line *A B*, which ſo placed, I lay a Ruler from the Center thereof to *E*, and I find the Courſe to be Weſt, and half a Point to the North, 125 Leagues.

Note, That it is neceſſary to have upon your Protractor two ſeveral Scales, a greater and a leſſer; for the greater the Scale is you keep your reckoning by, the truer ſhall your Accompts be.

How to keep a more exact Accompt of the Voyage by the Traverſe-Table.

THIS *Traverſe-Table* hath four parts, wherein the Rumbs are reckoned from the Meridian by every quarter-Point, beginning at the head of the Table, and ſo reckoning them upon the head of the Tables, it comes to the fourth Rumb, and then the Rumbs are reckoned at the bottom of the Tables back again. The Margin, or ſide of the Table, ſhews the Leagues ſailed; and the middle part ſhews how much you have ſailed either Eaſt or Weſt from the Meridian, North or South from the Latitude, according to the Letters *E. W. N. S.* at the top and bottom of the Tables, which Table is caſt up according to the 12 and 13 Propoſitions following.

For Example.

Suppoſe a Ship ſails 52 Leagues or Miles South-Weſterly upon the Sixth Rumb and an half, I would know how much I am to the Weſt-

Westward, and how much to the Southward. For this I look into the Table, and in the second part thereof, at the bottom of the Table, I find 6 Rumb $\frac{1}{4}$, and against 50 in the side, I find the Numbers 47, 84, and 14, 50, as they stand here in the Margin. Now because the Rumb of the Course stands at the bottom of the Table, I observe how the Letters stands, and they shew, that by this Course I am run 14 Leagues or Miles, and 50 parts (or an half) in Latitude to the Southwards, and 47 Leagues or Miles, and 80 parts, that is, almost 48 Leagues or Miles to the Westward from the Meridian I sailed from. But now, if the Ship's Course had been one Rumb from the Meridian, as it is at the top of this part of the Table, then you must have accounted according to the Letters at the top of the Table, *viz.* Southerly 47 Leagues 84 Parts, and Westerly 14 Leagues 50 Parts.

1 Rumb.	
NS	EW
47 84	14 50
EW	NS
2 Rumb.	

And thus any particular Course being found, you may set it upon the plain *Chart* by the Latitude and Departure from the Meridian, by laying a Ruler to the said Latitude and Longitude in any little Draught, better than a Protractor with a large Scale.

But when you have occasion to run several Courses, as you must in most Voyages, your best way will be to keep a Reckoning of them in such like Tables as this following.

The Places	The Course	Rumb from the Merid.	Distan. Run. L. pts.	North L. pts.	South L. pts.	East L. pts.	West L. pts.	Latit. D. M.	Long. D. pts.
A shews the *Lizard*								50 10	18 50
From *A* to *E*	S W	5 R.	59 0		14 50		47 84	49 27	14 80
From *E* to *G*	N W	7 R.	49 0	07 80			39 23	49 51	11 78
From *G* to *H*	South	0 R.	75 0		75 0			46 6	11 78
From *H* to *E*	N W	7 R.	62 00	09 80			49 54		
			62 00	01 98			49 56	48 42	2 74
			00 50	00 49			04 07		
		Sum	29 00	20 05	89 50		21 145		

To

To explain this, take the last Example before mentioned in the *Traverse-Board*, wherein a Ship sailing from the *Lizard* to the Island *Maida*, makes her first Course from * *A* to *F*, West by S. half the Point to the Southwards, that is, Southerly 6 Rumbs and a half. Now by the *Traverse-Table*, I find for this Course (as before showed) that the Ship hath sailed to the Southwards 14 Leagues 50 Parts, and to the Westwards 47 Leagues 94 Parts, which I set down accordingly under the Columns South and West.

* *See the Traverse-Board which hath this Example upon it*, Page 107.

The second Course the Ship makes, is from *F* to *G*, which is W. by N. 40 Leagues, that is, upon the 7 Rumb from the Meridian: And for this, I find in the Table the Northing to be 7 Leagues 80 Parts, and the Westing to be 39 Leagues 23 Parts, which likewise set down on their respective Columns of North and West.

The third Course in this Voyage, is from *G* to *H*, being 75 Leagues South; this without further trouble, I set down under the Column of South.

The fourth Course is from *H* to *E* being West, only half a Point to the North, which is 7 Rumbs and an half from the Meridian, the distance sailed 125 Leagues, the Northing and Westing whereof I take out of the Table at 3 times, because it cannot be found in 1 Line, and so set it down under the Columns North and West, as you see in this Table. And here now casting up the Account, I find first, that the Ship hath sailed in all 290 Leagues. Secondly, Finding in the North Column 20 Leagues 5 Parts, and in the South Column 89 Leagues 5 Parts, subtracting the less from the greater, I find I am to the Southward 69 Leagues 45 Parts, which makes 3 deg. 28 min. which subtracted from the Latitude of the *Lizard* 50 deg. 10 min. shews the Latitude I am in to be 46 deg. 42 min.

Thirdly, Casting up the West Column, I find I am to the Westward 211 Leagues 45 Parts, that is, 634 Miles: and by the former * Table I find, that in the Latitude of 4 deg. which is about the middle Latitude, that 40 Miles 15 Parts make one deg. of Longitude, by which dividing the said 634 Miles, I find about 15 deg. 80 parts, that is, 15 deg. 48 min. which subtracted from the Longitude of the *Lizard* 18 deg. 30 min. there remains 2 deg. 42 min. So that I am very near the Island *Maida*, whose Longitude is 2 deg. 40 min. and Latitude 46 deg.

* Page 109. *shewing how many Miles make a Deg. in any Latit.*

But

Miles Sailed	0 R 1/8				0 R 1/4				0 R 1/4				1 Rumb.				Miles Sailed
	2 d. 49 m.				5 d. 38 m.				8 d. 36 m.				11 d. 15 m.				
	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W	
1	00	00	00	03	00	99	00	10	00	99	00	15	00	98	00	20	1
2	01	99	00	19	01	98	00	20	01	98	00	29	01	96	00	39	2
3	02	99	00	13	02	98	00	29	02	97	00	44	02	95	00	58	3
4	03	99	00	20	03	98	00	39	03	96	00	59	03	92	00	78	4
5	04	99	00	25	04	97	00	49	04	95	00	73	04	90	00	98	5
6	05	98	00	29	05	97	00	59	05	94	00	88	05	88	01	17	6
7	06	98	00	34	06	97	00	69	06	92	01	03	06	86	01	37	7
8	07	98	00	39	07	96	00	78	07	91	01	17	07	85	01	56	8
9	08	98	00	44	08	95	00	89	08	90	01	32	08	83	01	70	9
10	09	98	00	49	09	95	00	98	09	89	01	47	09	81	01	95	10
20	19	97	00	98	19	90	01	96	19	78	02	93	19	61	03	90	20
30	29	96	01	47	29	85	02	94	29	67	04	40	29	41	05	85	30
40	39	94	01	96	39	80	03	92	39	56	05	86	39	22	07	80	40
50	49	93	02	45	49	75	04	90	49	45	07	33	48	03	09	75	50
60	59	92	02	94	59	71	05	88	59	34	08	80	58	84	11	70	60
70	69	91	03	43	69	66	06	86	69	24	10	27	68	65	13	65	70
80	79	90	03	92	79	61	07	84	79	13	11	73	78	47	15	60	80
90	89	89	04	41	89	56	08	82	89	02	13	20	88	27	17	55	90
100	99	87	04	90	99	51	09	80	99	91	14	67	98	08	19	50	100
200	199	85	09	80	199	03	19	60	198	82	29	34	196	16	39	99	200
	E	W	N	S	E	W	N	S	E	W	N	S	E	W	N	S	
	87 d. 11 m.				84 d. 22 m.				81 d. 34 m.				78 d. 45 m.				
	7 R 1/2				7 R 1/3				7 R 1/4				7 Rumb.				

Miles Sailed	1 R 1/8				1 R 1/3				1 R 1/2				2 Rumb.				Miles Sailed
	14 d. 4 m.				16 d. 52 m.				19 d. 41 m.				22 d. 30 m.				
	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W	
1	00	97	00	24	00	96	00	29	00	94	00	33	00	92	00	38	1
2	01	94	00	48	01	91	00	58	01	88	00	67	01	85	00	76	2
3	02	91	00	37	02	87	00	87	02	82	01	01	02	77	01	15	3
4	03	88	00	97	03	83	01	16	03	77	01	35	03	70	01	53	4
5	04	85	01	21	04	79	01	45	04	71	01	68	04	62	01	91	5
6	05	82	01	46	05	74	01	74	05	65	02	02	05	54	02	30	6
7	06	79	01	70	06	70	02	03	06	59	02	36	06	47	02	68	7
8	07	76	01	94	07	66	02	32	07	53	02	69	07	39	03	06	8
9	08	73	02	19	08	61	02	61	08	47	03	03	08	31	03	44	9
10	09	70	02	43	09	56	02	90	09	41	03	37	09	24	03	83	10
20	19	40	04	85	19	13	05	80	18	83	06	73	18	47	07	65	20
30	29	10	07	28	28	70	08	70	28	24	10	10	27	71	11	48	30
40	38	80	09	71	38	27	11	61	37	66	13	47	36	95	15	30	40
50	48	50	12	14	47	84	14	50	47	07	16	84	46	19	19	13	50
60	58	20	14	57	57	41	17	41	56	14	19	21	55	42	22	95	60
70	67	90	17	00	66	98	20	31	65	90	23	18	64	67	26	78	70
80	77	60	19	43	76	55	23	22	75	32	26	95	73	91	30	61	80
90	87	30	21	86	86	12	26	12	84	73	30	32	83	14	34	44	90
100	97	00	24	29	95	69	29	02	94	15	33	69	92	38	38	25	100
200	194	00	48	58	191	38	58	04	188	30	67	38	184	76	76	50	200
	E	W	N	S	E	W	N	S	E	W	N	S	E	W	N	S	
	75 d. 56 m.				73 d. 17 m.				70 d. 10 m.				67 d. 30 m.				
	6 R 1/2				6 R 1/3				6 R 1/4				6 Rumb.				

Points Quart.	2 R. ¼				2 R. ½				2 R. ¾				3 Rumb.				Points Rumbes
	25 d. 19 m.				28 d. 7 m.				30 d. 56 m.				33 d. 45 m.				
	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W	
1	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	1
2	01	01	00	01	01	01	00	01	01	01	00	01	01	01	00	01	2
3	02	02	01	02	02	02	01	02	02	02	01	02	02	02	01	02	3
4	03	03	01	03	03	03	01	03	03	03	02	03	03	03	02	03	4
5	04	04	02	04	04	04	02	04	04	04	02	04	04	04	02	04	5
6	05	05	02	05	05	05	02	05	05	05	03	05	05	05	03	05	6
7	06	06	03	06	06	06	03	06	06	06	03	06	06	06	03	06	7
8	07	07	03	07	07	07	03	07	07	07	04	07	07	07	04	07	8
9	08	08	04	08	08	08	04	08	08	08	04	08	08	08	05	08	9
10	09	09	04	09	09	09	04	09	09	09	05	09	09	09	05	09	10
20	18	18	08	18	18	18	09	18	18	18	10	18	18	18	11	18	20
30	27	27	12	27	27	27	13	27	27	27	15	27	27	27	16	27	30
40	36	36	17	36	36	36	18	36	36	36	20	36	36	36	22	36	40
50	45	45	21	45	45	45	23	45	45	45	25	45	45	45	27	45	50
60	54	54	25	54	54	54	27	54	54	54	30	54	54	54	33	54	60
70	63	63	29	63	63	63	32	63	63	63	35	63	63	63	38	63	70
80	72	72	34	72	72	72	37	72	72	72	41	72	72	72	44	72	80
90	81	81	38	81	81	81	42	81	81	81	46	81	81	81	50	81	90
100	90	90	42	90	90	90	46	90	90	90	50	90	90	90	55	90	100
200	180	180	85	180	180	180	93	180	180	180	101	180	180	180	111	180	200

E	W	N	S	E	W	N	S	E	W	N	S	E	W	N	S
64 d. 41 m.				61 d. 2 m.				59 d. 4 m.				56 d. 15 m.			
5 R. ¼				5 R. ½				5 R. ¾				5 Rumb.			

Points Quart.	3 R. ¼				3 R. ½				3 R. ¾				4 Rumb.				Points Rumbes
	36 d. 34 m.				39 d. 22 m.				42 d. 11 m.				45 d. 05 m.				
	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W	
1	00	81	00	60	00	77	00	63	00	74	00	67	00	71	00	71	1
2	01	61	01	19	01	58	01	27	01	48	01	34	01	41	01	41	2
3	02	41	01	79	02	38	02	90	02	22	02	01	02	12	02	12	3
4	03	21	02	38	03	00	02	54	02	96	02	69	02	83	02	83	4
5	04	02	02	98	03	81	03	17	03	70	03	36	03	54	03	54	5
6	04	82	03	57	04	61	03	81	04	44	04	03	04	24	04	24	6
7	05	62	04	17	05	41	04	44	05	18	04	70	04	95	04	95	7
8	06	42	04	76	06	18	05	07	05	92	05	47	05	66	05	66	8
9	07	23	05	36	06	64	05	71	06	67	06	04	06	36	06	36	9
10	08	03	05	56	07	74	06	34	07	41	06	72	07	07	07	07	10
20	16	06	11	91	15	46	12	68	14	81	13	43	14	14	14	14	20
30	24	09	17	87	23	19	19	03	22	22	20	14	21	21	21	21	30
40	32	12	23	82	30	9	25	37	29	63	26	86	28	28	28	28	40
50	40	16	29	78	38	65	31	71	37	03	33	57	35	35	35	35	50
60	48	19	35	74	46	38	38	06	44	44	40	29	42	42	42	42	60
70	55	22	41	69	54	11	44	41	51	85	47	00	49	49	49	49	70
80	64	25	47	64	61	84	50	75	59	25	53	72	56	56	56	56	80
90	72	28	53	61	69	57	57	09	66	63	60	44	63	63	63	63	90
100	80	32	59	56	77	30	63	43	74	00	67	15	70	70	70	70	100
200	161	64	119	12	154	60	126	86	148	1	134	30	141	141	141	141	200

E	W	N	S	E	W	N	S	E	W	N	S	E	W	N	S
57 d. 26 m.				50 d. 37 m.				47 d. 49 m.				45 d. 00 m.			
4 R. ¼				4 R. ½				4 R. ¾				4 Rumb.			

But yet the Longitude may be more certainly known, if you cast it up at every Course, which you may thus do exactly. If you keep your account in Leagues, then 20 Leagues making one deg. divide your Leagues by 20, or take the half of your number of Leagues, making the Figures one place less, it shews the deg. and 100 parts. Thus, in the first Course the Westerly Distance from the Meridian being 47 Leagues 84 Parts, yields 2 deg. 39 parts, which should be the difference of Longitude according to the plain Chart.

But because the deg. of Longitude grow less as the Latitude increases, you must proportion this by the middle Latitude, thus, As the Sine Complement of the middle Latitude of the Course is to the *Radius*, so the deg. and parts of Longitude of the plain Chart to the deg. and parts of Longitude of the true Chart or Globe.

Thus for the Course aforesaid, the middle Latitude being 49 deg. 48 min. and the difference from the Meridian 2 deg. 39 parts of the plain Chart:

As Sine Complement 49 d. 48 m. to 90 d. So 2 d. 39 pts. to 3 d. 70 pts.

6434. 10000 2, 39 3, 70

And thus you may find the true Longitude of any Course as exactly, and with as little trouble as any other way, and so find out your Longitude and Latitude all along your Voyage.

If you desire to be more fully instructed herein, you may see this applied to all kinds of sailings, in my Book called, *The Advancement of the Art of Navigation.*

Here followeth a brief Table of Sines, *for Arithmetical Calculation, the total* Sine *whereof is* 10000, *with certain necessary Propositions to be wrought thereby; by which few things proposed, and Examples thereto annexed, any one that hath either an ingenious Spirit, or a willing Mind, to the Practice of the* Mathematical Sciences, *may attain to much knowledg therein.*

A brief Declaration of the same.

WHat the Table of Sines is, hath been very learnedly explained by others, and therefore needless it is for me to discourse thereof; only take these few Instructions for the help of those, which as yet have no knowledg thereof. First, Know that Sailing, which is the principal thing here aimed at, is performed by a true and perfect knowledg

of the Sphere, by the Projection whereof, all Calculation, Tables calculated, and Instruments for Observations are invented, protracted, framed, and made.

What this Sphere is, I need not to discuss, the chief or great Circles thereof consisting of 360 Degrees, and one quarter thereof being 90 Degrees, which quarter being taken from the whole Circumference, consisteth of these three Particulars, *viz.* An Arch or part of a Circle, being indeed 90 Degrees, or a quarter of the whole Circle, a right Angle, and two equal sides thereto, of which the one is the Base or Ground-Line, the other a Perpendicular let fall thereon at right Angles, the utmost Ends or Extensions of which two Lines are the limits of the aforesaid Arch or quarter of the Circle: the which three Parts so fitted together in their due order, shew the perfect Platform of one quarter of the whole Circle, commonly called a Quadrant: the Base or Ground-Line whereof being divided into 10000 equal parts, is *Sinus Totus*, or the whole Sine; and the whole Arch or quarter of a Circle into 90 deg. is the whole Arch belonging to the said whole Sine.

Within which Quadrant any Number of degrees or minutes counted from the beginning or first Perpendicular, may be called an Arch or Part of a Circle, and another Perpendicular let fall therefrom to the aforesaid Base or Ground-Line, the number of equal Parts that the said Perpendicular falleth upon, is the right Sine to the Arch given; and the Complement of the Arch given, is the Remainder thereof, it being taken from 90 deg. or the whole Quadrant. To find out the right Sine of any given Arch, look in the head of the following Table for the deg. thereof, and if there be any minutes therewith, look for the min. at the left-side of the Table, and carrying your Eye downwards from the deg. till you come right against them, in the number which you find in the common Angle to them both, is the right Sine of your given Arch desired: As if you desire the Sine of 35 deg. 20 min. look in the head of the Table for 35, and upon the left-side thereof for 20, and in the common Square or Angle right against them both, you shall find 5783, which is the Sine of 35 deg. 20 min. and if you subtract 35 deg. 20 min. from 90 deg. the Remainder 54 deg. 40 min. is the Complement thereof, whose right Sine (found as before is taught) is 8158. What the versed Sine is, and how found out, is afterward shewed. I doubt not but that these few words will suffice for the explaining of the Table following, whose large and ample uses for Navigation, and other the Mathematical Practices, these following exemplary Propositions will in some reasonable sort make manifest: By which few here proposed

and

and answered, the Ingenious may gather the manifest uses thereof, being that indeed the benefit to be reaped thereby is great, and the Propositions to be wrought thereby infinite. Whoso desires more perfection in this kind of *Navigation*, and generally in all *Mathematical Practices*, let them spend some time in the Study of that excellent Book of Mr. *Richard Norwood* of the *Doctrine of Triangles*, applied to the three principal kinds of Sailing.

Certain Propositions to be wrought by the Tables of Sines.

The Sun's true Place being known, to find his Declination.

Prop. 1.

AS the whole Sine is to the Sine of the greatest Declination; so is the Sine of the Sun's distance from the nearest Equinoctial Point, to the Sine of the Declination for the day proposed.

Example.

Suppose the true place of the Sun to be in 20 deg. 36 min. of *Taurus*, which is 50 deg. 36 min. from the beginning of *Aries*, or the vernal Equinoctial Point: therefore I must multiply the Sine of 50 deg. 36 min. the Sun's distance from the Equinoctial Point, by the Sine of 23 deg. 32 min. the greatest Declination, and that Product must be divided by the whole Sine, whose several Sine being found out in the Table following, and set in order, the work will stand thus:

If 90 give 23 32. What 50 36?

10000 3993 7727 3085

Facit 3085, whose nearest Arch 17 deg. 58 min. is the true Declination of the Sun, the day and year aforesaid.

The Declination of the Sun given, to find his place in the Zodiack.

Prop. 3.

AS the Sine of the greatest Declination is to the whole Sine, so is the Sine of the Declination for the day proposed, to the Sun's place or distance from the nearest Equinoctial Point.

Example.

Suppose I find that the Declination of the Sun is 17 deg. 58 min. North, therefore I say:

If 23 32 give 90 0 What 17 58?

3993 10000 3083 7727

Facit nearest 7727, whose Arch 50 deg. 30 min. is the Sun's distance from the vernal Equinoctial Point of *Aries*, from which taking 30 deg.

the whole Sine of *Aries*, the Remainder 20 deg. 58 min. shews the Sun to be so much entred into *Taurus*, which is the next Sine.

The Latitude of any place, and the Declination of the Sun given, to find the Altitude.

Prop. 4.

AS the Sine of the Complement of the Latitude, is in proportion to the whole Sine; so is the Sine of the Sun's Declination to the Altitude.

Example.

The Sun's Declination being 11 deg. 48 min. North, I desire the Amplitude of the Sun, *viz.* How much the Sun doth rise and set from the true East and West Points of the Horizon, towards the North or South, in the Latitude of 51 deg. 40 min. To know which, the work is thus:

If 38 deg. 20 min. the Complement of the Latitude given, 90 deg. the Arch of the whole Sine; what gives 11 deg. 48 min. the Declination of the Sun?

38 Deg.	20 Min.	90	11 Deg.	48 Min.
6202		10000	2045	3297

Facit 3297 neatest, whose Arch sought out in the Table of Sines, is 19 deg. 15 min. for the Amplitude of the Sun's Declination proposed: the same divided by 11 and one quarter, the number of Degrees that belong to a Point of the Compass, sheweth one Point and eight deg. which the Sun rises and sets to the Northward of the East and West, being that the Declination is North: for if the Declination were South, then were the Amplitude Southerly.

The Declination and Amplitude of the Sun given, to find the height of the Pole.

Prop. 5.

AS the Sine of that Amplitude is in proportion to the Sine of the Declination; so is the whole Sine to the Sine of the Complement of the Latitude.

Example.

The Declination 11 deg. 43 min. and the Amplitude 19 deg. 7 min. I demand the height of the Pole? Say,

If 19	7	give 11	43	What 90?	0
3275		2031		10000	6202

Facit 6202 neatest, whose Arch in the Table of Sines being 38 deg. 40 min. is the height of the Equinoctial, or the Complement of the Latitude;

titude; that ſubtracted from 90 deg. leaves 51 deg. 40 min. for the height of the Pole, or Latitude of the place deſired.

The true Place and Declination of the Sun given, to find the Right Aſcenſion.

Prop. 8.

AS the Sine of the Complement of the Declination is to the total Sine, ſo is the Sine of the Complement of the Sun's diſtance from the beginning of *Aries* to the Complement of the *Right Aſcenſion*.

Example.

I deſire the Right Aſcenſion of the Sun being in 10 deg. 14 min. of *Taurus*, in which place his Declination is 14 deg. 56 min. and the Complement thereof 75 deg. 4 min. and the diſtance from the beginning of *Aries* 40 deg. 14 min. whoſe Complement is 49 deg. 46 min. I ſay then,

If 75 54 give 90. What 49 46 Minutes?

9663 10000 7934 7900

Facit 7900, whoſe Arch in the Table of Sines is 52 deg. 11 min. the Complement whereof 37 deg. 49 min. is the Sun's Right Aſcenſion, the ſame converted into Hours, by allowing 15 deg. to an Hour, gives 2 hours 31 min. 16 ſeconds.

This is to be underſtood, when the Sun is betwixt the beginning of *Aries* and the Tropick of *Cancer*; for if the Sun be in the Tropick of *Cancer*, then is the Right Aſcenſion 90 deg. or 6 hours: and if the Sun be betwixt the Tropick of *Cancer*, and the Equinoctial Point of *Libra*, ſubtract the diſtance that the Sun is from the beginning of *Aries*, out of 180 deg. and with the Remainder work as before for the Right Aſcenſion; which Aſcenſion ſo found, take from 180, and the Remainder is the Right Aſcenſion deſired: But if the Sun be between the Equinoctial of *Libra*, and the Tropick of *Capricorn*, ſubtract the ſaid diſtance from the beginning of *Aries*, out of 180 deg. and if betwixt the Tropick of *Capricorn*, and the beginning of *Aries*, take the ſaid diſtance out of 360 deg. and then work as before. One Example or two will make all this plain unto you.

The true place of the Sun being 17 deg. 51 min. of *Cancer*, is 107 deg. 51 min. from the beginning of *Aries*, which taken from 180, leaves 72 deg. 9 min. whoſe Complement is 17 deg. 51 min. the Sun's Declination being then 22 deg. 20 min. the Complement thereof is 67 deg. 40 min. Say then,

If 67 40 give 90. What 17 51 Minutes?

9259 10000 3065 3314

Facit

Facit 3314, whose Arch is 10 deg. 21 min. the Complement whereof 70 deg. 39 min. taken from 180, leaves 109 degrees 21 min. for the Right Ascension desired, which converted into hours, makes 7 hours 17 min. 24 seconds. Again, I desire the right Ascension of 20 deg. 40 min. of *Capricorn*, whose distance is continual, proceeding from the beginning of *Aries*, being 290 deg. 40 min. taken from 60, leaves 69 deg. 20 min. with the Complement whereof 20 deg. 40. min. and the Complement of the Declination of the Sun upon the Point of the Sun's place 68 deg. 6 min. I work as followeth.

If 68 6 give 90. What 20 40?

9278 10000 3589 3803

Facit 3803, whose Arch is 22 deg. 21 min. the Complement whereof 67 deg. 39 min. taken from 360, leaves 292 deg. 21 min. for the Right Ascension desired, the same converted into hours, is 19 hours 29 min. 24 seconds.

The Latitude and Declination of the Sun known, to find the Difference Ascensional.

Prop. 6.

As the Sine of the Complement of the Latitude, is to the Sine of the Latitude; so is the Sine of the Declination to the Quotient found: Again, as the Sine of the Complement of the Declination, is to the whole Sine; so is the said Quotient found, to the Difference Ascensional.

For Example.

I would know the difference Ascensional: when the Declination is 20 deg. 6 min. and the Latitude 51 deg. 40 min. I say,

If 38 28 give 51 40. What 20 6?

9391 10000 3437 4346

Facit 4346, for the Quotient found. Then again, I say,

If 62 54 give 90. What 4346?

9391 10000 4346 4627

Facit 4627, whose Arch in the Table of Sines 27 deg. 34 min. is the difference Ascensional for the day proposed; the same reduced into hours and minutes, make 1 hour 50 min. which taken from 6 of the Clock, the hour that the Sun riseth being in the Equinoctial, leaveth 4 hours 10 min. at which time the Sun riseth, and the said Ascensional difference added to 6 of the Clock, makes 7 of the Clock 50 min. for the Sun's setting.

Again, the said Ascensional difference doubled, and added to 12 hours, the

the time from 6 in the Morning till 6 at Night, makes 15 hours 40 min. from the whole length of the day.

This is when the Sun hath North Declination: for if the Declination be South, then the Aſcenſional difference added to 6 of the Clock, gives the Sun's riſing; and taken from 6, leaves the ſetting; and being doubled, and taken from 12 Hours, leaves the length of the day, as aforeſaid.

The Amplitude and Difference Aſcenſional of the Sun or Star given, to find the Declination.

Prop. 7.

AS the Sine of the time of the Sun's Riſing, converted into deg. and min. is to the Sine of the Complement of the Amplitude; ſo is the whole Sine to the Sine of the Complement of the Declination.

Example.

The difference Aſcenſional being 27 deg. 34 min. ſhews the Sun to riſe at 4 a Clock 10 min. which converted into degrees, makes 62 deg. 30 min. and the Amplitude being found, as before is ſhewed in the third Propoſition, is 33 deg. 38 min. and the Complement thereof 56 deg. 34 min. Say then,

If 62	30	give	56	22	What	96?	
8870			8	26		10000	6386

Facit 6386, whoſe Arch 69 deg. 50 min. the Complement thereof 20 deg. 10 min. is the Declination deſired.

The Latitude and Declination given, to find the Meridional Altitude.

Prop. 8.

IF the Sun hath North Declination, and the Complement of the Latitude to the Declination, the Product is the Meridional Altitude.

For Example.

If the Declination be 23 deg. 30 min. North, and the Latitude 51 deg. 48 min. the Complement thereof 38 deg. 20 min. added to 23 deg. 30 min. makes 61 deg. 50 min. for the Meridian Altitude: But if the Meridian Altitude be 23 deg. 30 min. South, and the Latitude 51 deg. 40 min. ſubtract 23 deg. 30 min. the Declination from 38 deg. 20 min. the Complement of the Latitude, and the Remainder 14 deg. 15 min. is the Altitude deſired: and if the Sun be in the Equinoctial, having no Declination, then is the Meridian Altitude equal to the Complement of the Latitude.

The

The Latitude and Declination known, to find the height of the Sun at any hour of the Day.

Prop. 9.

First, you are to consider, whether the Sun be in the Equinoctial, or whether he hath North or South Declination: for if the Sun be in the Equinoctial, then as the whole Sine is to the Sine of the Complement of the Latitude, so is the Sine of the Complement of the Sun's distance from Noon (allowing 15 deg. for every hour) to the Sine of the Altitude desired.

Example.

At any year o day, the Sun then having no Declination, the Latitude 51 deg 40 min. I desire the Sun's height at 9 a Clock before Noon, or at 3 Afternoon. the Complement of the Latitude is 38 deg. 20 min. and the hours distance from Noon 45 deg. whose Complement is also 45 deg. Say then,

If 90	give 38 20.	What 45?	
10000	6202	7071	4385

Facit 4385, whose Arch 26 deg. is the height of the Sun above the Horizon, at the time and place proposed.

If the Sun have Declination, then is the working somewhat more, except only at 6 a Clock either before or after Noon, for which hour, as the whole Sine is to the Sine of the Latitude, so is the Sine of the Declination to the Sine of the Altitude.

Example.

The Latitude being 51 deg. 40 min. the Declination 11 deg. 48 min. Say,

If 90	give 51 40.	What 11 48?	
10000	7844	2045	1604

Facit 1604, whose Arch 9 deg. 14 min. is the Altitude desired.

But for any other hour of the day, work as followeth: If it be in the Forenoon, subtract the hour given out of 12 hours, and reduce the Remainder into degrees; and if the Remainder be less than 6 hours, seek the Sine Complement of it, and subtract it out of 10000, and keep the Remainder. But if the former Remainder be more than 6 hours, subtract 6 hours from it, and keep the Sine of the Remainder, and add it to 1000, and keep the Sum; then multiply the first Remainder kept, or this last Sum kept, by the Sine of the Complement of the Declination, cutting off four Figures to the right-hand from the Product, and multiply the Product by the Sine of the Complement of the Latitude, cutting off also four

four Figures to the right-hand from the Product, and this laſt Product ſubtract from the Sine of the Meridian Altitude of the Sun, and the Remainder is the Sine of the Sun's Altitude required.

You are to note, if the hour given be after noon, you muſt take the hour given it ſelf, and obſerve as before, whether it be more or leſs than 6 hours.

Example.

Any day or year at 9 of the Clock, Latitude 51 deg. 30 min. Declination 11 deg. 43 min. North, ſubtract 9 from 12, the Remainer is 3, that being reduced, is 45 deg. 0 min. whoſe Sine Complement is 7071, which ſubtracted from 10000, the Remainder is 2929, which multiplied by 9791, the Sine Complement of the Declination 78 deg. 17 min. the Product is 2867, and this Product multiplied by 6225 the Sine Complement of the Latitude, the laſt Product is 1784. Now the Meridian Altitude is 50 deg. 13 min. whoſe Sine is 7685, from which ſubtract the former number, the Remainder is 5901, the Sine of 36 deg. 9 min. the Sun's Altitude required.

To find the Sun's Azimuth, having the Declination and Altitude of the Sun, and the height of the Pole given.

Prop. 10.

ADD the Complement of the Latitude to the Sun's Altitude, and from the Sine of that Sum ſubtract the Sine of the Sun's Declination, and keep the Remainder, when the Sun hath North Declination: but if the Sun hath South Declination, add the Sine off the Declination to the Sine of that Sum, and keep the whole Sum, which Remainder or Sum, multiply by the 10000 for the dividend, and multiply the Sine of the Complement of the Sun's Altitude, by the Sine of the Complement of the Latitude for the Diviſor, cutting off four Figures to the right-hand from the Product, by which Diviſor divide the former dividend, and if the Quotient be leſs than 10000, ſubtract it from 100000, and the Remainder is the Sine of the Azimuth from the Eaſt or Weſt Northward: But if the Quotient be more than 10000, ſubtract 10000 from it, and the Remainder is the Sine of the Azimuth from the Eaſt or Weſt Southwards.

Note, If the Sun have no Declination, then the Sine of the Sum of the Sun's Altitude, and the Complement of the Latitude muſt be multiplied by 10000 for the Dividend, and the Diviſor muſt be as before.

Example.

The Sun having 13 deg. 0 min. North Declination, in Latitude 51 deg. 30 min. being 43 deg. 0 min. high in the Forenoon, I demand the Azimuth? the Sum of the Sun's Altitude and Complement of the the Latitude 81 deg. 30 min. the Sine 9890, and the Sine of the Declination 2249, the Difference 7644, which multiplied by 10000 for the Dividend, is 76410000, the Sine of the Complement of the Altitude is 7313, which multiplied by 6125, the Sine of the Complement of the Latitude, the product is 4552 for the Divisor, and the Quotient is 16789, from which 10000 subtracted, the Remainder is 6789, the Sine of 42 deg. 44 min. the Sun's Azimuth from the East Southwards.

For the better understanding of this Proposition, take these five Cases of Mr. *Hanson*'s.

1. *For the Sun's Azimuth having no Declination.*

ADD the Complement of the Latitude to the Complement of the Almicanter, which if the total be more than a Quadrant, subtract 90, and set down the Sine of the Remainder for the first Number. Again, add the Complement of the Latitude and the Almicanter, and add the Sine thereof to the former, from the one half of that total subtract your first Number or Sine, and set down the Remainder: Then,

As the half of the two first Numbers added, is in proportion to the whole Sine, so is the said Remainder to the Sine of the Sun's true Azimuth.

Example.

Lat. 51 deg. 30′ the Compl. 38 d. 30′ } Added makes 108 deg. 30′ Almicanter 20 d. Complement 70 deg. 0′ } 90 sub. leaves 18 deg. 30′ whose Sine 3173 is the first Number. Again, Complement of the Latitude 38 deg. 30′, Almicanter 20 deg. added, makes 58 deg. 30′, whose Sine 8526 is the second Number, those two Numbers added make 11699, the half thereof 5849, from which subtract 3173 the first Numbers, rests 2676 for the Remainder: Then say,

As 5849 the half of the two first Numbers, is to 10000, the whole Sine; so is 2676, the Remainder, to the Azimuth desired.

Facio

Facit 4575, whose Arch 27 deg. 17 min. is the Azimuth from the East, Southward.

2. *When the Sun hath North Declination, the two Complements being equal to a Quadrant.*

ADD the Complement of Latitude with the Almicanter only, and from half the Sine thereof, subtract the Sine of the Declination, and setting down the Remainder.

As the half aforesaid, is to the whole Sine, so is the Remainder aforesaid to the Sine of the Azimuth desired.

3. *When the Sun hath North Declination, the two Complements are less than a Quadrant.*

ADD the Complement of the Latitude, and the Complement of the Almicanter, setting down the Sine of the Complement thereof; then add the Almicanter, and the Complement of the Latitude, and from the Sine thereof subtract the former, setting down half of the Remainder for the first found Number. Again, subtract the Sine of the first Complement from the Sine of the Declination and the Remainder thereof. Again, subtract from your first found Number, and set the Remainder thereof down for your second Number: and then,

As the first found is to the whole Sine, so is the second to the Azimuth desired.

4. *When the Sun hath North Declination, and the two Complements more than a Quadrant.*

ADD the Complement of the Latitude, and the Complement of the Almicanter, which being more than 90, subtract 90, and set down the Sine of the Remainder; then add the Almicanter and Complement of the Latitude, and set down the Sine thereof, and both the Sines together, and take the half thereof for the first found Number; then to the Sine of the first two Complements, and the Sine of the Declination, and from that Total subtract the first found, and set down the Remainder for the second found. And then,

As the first found is to the whole Sine, so is the second found to the Sine of the Azimuth desired.

5. *When the Sun hath South Declination, and the two Complements more than a Quadrant.*

ADD the Complements, subtract 90, set down the Sine of the Remainder, add also the Almicanter, and the Complement of Latitude, add both their Sines, and set down half the total for the first found, then subtract the Sine of the Declination for the Sine of the Remainder of the first two Complements, and that Remainder again from the first found, which last Remainder set down: And say,

As the first found is to the whole Sine, so is the second found to the Sine of the Azimuth desired.

The Latitude given, how many Minutes or Miles of the Equinoctial make a degree of Longitude in any Parallel.

Prop. 11.

AS the whole Sine is in Proportion to 60, so is the Sine of the Complement of the Latitude, to the Miles answerable to a Degree in the Latitude desired.

I desire to know how many Miles in running East or West in the Latitude of 51 deg. 40 min. will alter one deg. of Longitude? Say,

If	90	give	60.	What 38 20?
	10000		60	6202 37

Facit 37, for the Number of Miles answerable to a Degree in the Latitude desired.

The Course and Distance given, to find out the difference of Latitude.

Prop. 12.

AS the whole Sine is to the Miles of way run, so is the Sine of the Courses distance from East to West, to the min. of difference of Latitude.

Example.

Running W. S. W. which is 22 deg. 30 min. from the West 75 Leagues, or 225 Miles, I demand the difference of Latitude? Say,

If	90	give	225	What 67 30?
	10000		22500	3827 86

Facit 86 min. or 1 deg. 26 min. for the difference of Latitude upon the said Course and Distance.

The Course and Distance given, to find the Difference of Longitude.

Prop. 13.

AS the whole Sine is to the Miles of way that you have run, so is the Sine of the Degree that your Course is distant from South or North, to the Miles that you are departed from your first Meridian.

Run-

Running N. W. and by N. which is 33 deg. 45 min. from the North 60 Leagues, or 180 Miles; I demand the Difference of Longitude? Say,

If 90 give 180. What 33 45?.

16000 180 5556 100

Facit 100 Miles, which you are departed from the Meridian to the Westward, which if you divide by the Number of Miles answerable to a degree of Longitude, in the Latitude where you then find your self to be, the Quotient gives you the deg. and min. of the difference of Longitude.

By the distance and departure from the Meridian given, to find the Course.

Prop. 14.

AS the Miles of distance that you have run, is in proportion to the whole Sine; so is the Miles of your departure from the Meridian to the Sine of your Course from South or North.

Example.

Being departed from the first Meridian 75 Miles, in the running of 50 Leagues or 150 Miles; I demand upon what Point I have sailed, it being betwixt South and West? Say,

If 150 give 10000. What 75? 5000

Facit 5000, whose Arch 30 Degrees, is the Distance from South towards West that the Course is, which is South-west and by South, and Southerly.

The Latitude, Declination, and height of the Sun given, to know the hour of the Day.

Prop. 15.

SUbtract the Sine of the Sun's Altitude given, out of the Sine of the Sun's Meridian Altitude, (you may find the Meridian Altitude by the eighth Proposition foregoing) and multiply the Remainder by 10000 for the Dividend; and multiply the Sine of the Complement of the Sun's Declination, by the Sine of the Complement of the Latitude for the Divisor, by which Divisor divide the former Dividend; and if the Quotient be more than 10000, subtract 10000 from it, and the Remainder is the Sine of the hour wanting of 6 in the Forenoon, or the hour past 6 in the Afternoon: but if the Quotient be less than 10000, subtract it from 10000, and the Remainder is the Sine of the hour past 6 in the Forenoon, or wanting of 6 in the Afternoon.

Example:

Example.

In Latitude 51 deg. 30 min. the Declination 15 deg. 0 min. North, the Altitude 43 deg. 0 min. in the Forenoon; I demand the hour of the day; the Meridian Altitude 53 deg. 30 min. the Sine 8038, and the Sine of the Altitude given 6820, the difference 1218, the which multiplied by 10000, is 12180000 for the Dividend, the Sine of the Complement of Declination 9659, which multiplied by 6225, the Sine of the Complement of the Latitude, the Product is 6012 for the Divisor, and the Quotient is 2025, which subtracted from 10000 the Remainder is 7975, the Sine of 52 deg. 53 min. the hour past 6 in the Morning, which being reduced, is 3 hours 31 min. and an half added to 6, makes 9 of the Clock, and 31 min. and an half, the hour of the Day.

To find the Sinus Versus *of any given Arch.*

Prop. 16.

IF the Arch given be less than 90, subtract it from 90, and the Sine of the Remainder taken from the total Sine, leaves the *Sinus Versus*: But if the given Arch be greater than 90 deg. subtract 90 deg. therefrom, and seek the Sine of the Remainder, which is always the Complement of the given Arch; which *Sinus* add to the whole Sine, and the Total thereof is the *Sinus Versus* of the given Arch desired.

Example.

To know the *Sinus Versus* of 47 deg. 12 min. the Complement thereof is 42 deg. 48 min. whose Sine 6794 taken 10000, the whole Sine, resteth 3206, and reversed Sine 47 deg. 12 min.

Likewise to know the reversed Sine of 137 deg. 25 min. which is more than 90 deg. take 90 therefrom, there resteth 47 deg. 25 min. the *Sinus* whereof 7363 added to the whole Sine, maketh 17363 for the reversed Sine of 137 deg. 25 min.

Here followeth a Table of Sines *to a Radius of* 10000.

A Table of Sines.

The Degrees of the Quadrant.

M.	0	1	2	3	4	5	6	7	8	9	
1	03	177	352	526	700	874	1048	1222	1395	1567	59
2	06	180	355	529	703	877	1051	1224	1398	1570	58
3	09	183	358	533	706	880	1054	1227	1400	1573	57
4	12	186	361	535	709	883	1057	1230	1403	1576	56
5	14	189	363	538	712	886	1060	1233	1406	1579	55
6	17	192	366	542	715	889	1063	1236	1409	1582	54
7	20	195	365	544	718	892	1065	1239	1412	1584	53
8	23	198	372	547	721	895	1068	1242	1415	1587	52
9	26	201	375	549	724	898	1071	1245	1418	1590	51
10	25	204	378	552	726	900	1074	1247	1421	1593	50
11	32	206	381	555	729	903	1077	1250	1424	1596	49
12	35	209	384	558	732	906	1080	1253	1426	1599	48
13	38	212	387	561	735	909	1083	1256	1429	1602	47
14	41	215	390	564	738	912	1086	1259	1432	1605	46
15	44	218	393	567	741	915	1089	1262	1435	1608	45
16	40	221	395	570	744	918	1091	1265	1438	1610	44
17	48	224	398	573	747	921	1094	1268	1441	1613	43
18	52	227	401	576	750	924	1097	1271	1444	1616	42
19	55	230	404	578	753	927	1100	1273	1446	1615	41
20	58	233	407	581	756	930	1103	1276	1449	1622	40
21	61	235	410	584	758	934	1106	1279	1452	1625	39
22	64	238	413	587	761	935	1109	1282	1455	1627	38
23	67	241	416	590	764	938	1112	1285	1458	1630	37
24	70	244	419	593	767	941	1115	1288	1461	1633	36
25	73	247	422	596	770	944	1118	1291	1464	1636	35
26	76	250	425	599	773	947	1120	1294	1467	1639	34
27	78	253	427	602	776	950	1123	1297	1469	1642	33
28	81	256	430	605	779	953	1126	1299	1472	1645	32
29	84	259	433	607	782	956	1129	1302	1475	1648	31
30	87	262	436	610	785	959	1132	1304	1478	1650	30
M	89	88	87	86	85	84	83	82	81	80	M

A Table of Smes.

The Degrees of the Quadrant.

M	0	1	2	3	4	5	6	7	8	9	
31	90	265	439	613	787	961	1135	1308	1481	1653	29
32	93	268	442	616	790	964	1138	1311	1484	1656	28
33	96	270	445	619	793	967	1141	1314	1487	1659	27
34	99	273	448	622	796	970	1144	1317	1490	1662	26
35	102	276	451	625	799	973	1146	1320	1492	1665	25
36	105	279	454	628	802	976	1149	1322	1495	1668	24
37	107	282	456	631	805	979	1152	1325	1498	1670	23
38	110	285	460	634	806	982	1155	1328	1501	1673	22
39	113	288	462	637	811	985	1158	1331	1504	1676	21
40	116	291	465	640	814	988	1161	1334	1507	1679	20
41	119	294	468	642	816	990	1164	1337	1510	1682	19
42	122	297	471	645	819	993	1167	1340	1513	1685	18
43	125	300	474	648	822	996	1170	1343	1515	1688	17
44	128	302	477	651	825	999	1172	1346	1518	1691	16
45	131	305	480	654	828	1002	1175	1348	1521	1693	15
46	134	308	483	657	831	1005	1178	1351	1524	1696	14
47	137	311	485	660	834	1008	1181	1354	1527	1699	13
48	140	314	488	663	837	1010	1184	1357	1530	1702	12
49	142	317	491	666	840	1013	1187	1360	1533	1705	11
50	145	320	494	668	843	1016	1190	1363	1536	1708	10
51	148	323	497	671	845	1019	1193	1366	1538	1711	9
52	151	326	500	674	848	1022	1196	1369	1541	1714	8
53	154	329	503	677	851	1025	1198	1372	1544	1716	7
54	157	331	506	680	854	1028	1201	1374	1547	1719	6
55	160	334	505	683	857	1031	1204	1377	1550	1722	5
56	163	337	512	686	860	1034	1207	1380	1553	1725	4
57	166	340	515	689	863	1037	1210	1383	1556	1728	3
58	169	343	517	692	866	1039	1213	1386	1559	1731	2
59	172	347	520	695	869	1042	1216	1389	1561	1734	1
60	174	350	523	697	871	1045	1219	1392	1564	1736	0
M	89	88	87	86	85	84	83	82	81	80	M

A Table of Sines.

The Degrees of the Quadrant.

M.	10	11	12	13	14	15	16	17	18	19	
1	1739	1911	2082	2252	2422	2591	2759	2926	3093	3258	59
2	1742	1914	2085	2255	2425	2594	2762	2929	3096	3261	58
3	1745	1917	2088	2258	2428	2596	2765	2932	3098	3264	57
4	1748	1919	2090	2261	2430	2597	2767	2935	3101	3267	56
5	1751	1922	2093	2264	2433	2602	2770	2938	3104	3269	55
6	1754	1925	2096	2267	2436	2605	2773	2940	3107	3272	54
7	1757	1928	2097	2269	2439	2608	2776	2943	3109	3275	53
8	1759	1931	2100	2272	2441	2611	2779	2946	3112	3278	52
9	1762	1934	2103	2275	2445	2613	2781	2949	3115	3280	51
10	1765	1937	2105	2276	2447	2618	2784	2951	3118	3283	50
11	1768	1932	2110	2281	2450	2619	2787	2954	3120	3286	49
12	1771	1942	2112	2283	2453	2622	2790	2957	3123	3289	48
13	1773	1945	2117	2286	2456	2625	2793	2960	3126	3291	47
14	1776	1948	2119	2289	2459	2628	2795	2963	3129	3294	46
15	1779	1951	2121	2292	2462	2630	2798	2965	3132	3297	45
16	1782	1954	2125	2295	2464	2633	2801	2968	3134	3300	44
17	1785	1957	2127	2298	2467	2636	2804	2971	3137	3302	43
18	1788	1959	2130	2300	2470	2639	2807	2974	3140	3305	42
19	1790	1962	2133	2303	2473	2641	2809	2976	3143	3308	41
20	1793	1965	2136	2306	2476	2644	2812	2979	3146	3310	40
21	1796	1967	2139	2309	2478	2647	2815	2982	3148	3313	39
22	1799	1971	2142	2312	2481	2650	2818	2985	3151	3316	38
23	1802	1974	2145	2315	2484	2653	2821	2988	3154	3319	37
24	1805	1977	2147	2317	2487	2655	2823	2990	3156	3322	36
25	1808	1979	2150	2320	2490	2658	2826	2993	3159	3324	35
26	1810	1982	2152	2323	249.	2661	2829	2996	3162	3327	34
27	1813	1985	2156	2326	2495	2664	2832	2999	3165	3330	33
28	1816	1988	2159	2329	2498	2667	2835	3001	3167	3332	32
29	1819	1991	2161	2331	2501	2669	2837	3004	3170	3335	31
30	1822	1994	2164	2334	2504	2672	2840	3007	3273	3338	30
	79	78	77	76	75	74	73	72	71	70	M

A Table of Sines.

The Degrees of the Quadrant.

M	10	11	12	13	14	15	16	17	18	19	
31	1825	1996	2167	2337	2507	2675	2843	3010	3176	3341	29
32	1828	1999	2170	2340	2509	2678	2846	3013	3178	3343	28
33	1830	2002	2173	2343	2512	2681	2848	3015	3181	3346	27
34	1833	2005	2176	2346	2515	2683	2851	3018	3184	3349	26
35	1836	2008	2178	2349	2518	2686	2854	3021	3187	3352	25
36	1839	2011	2181	2351	2521	2689	2857	3024	3189	3354	24
37	1842	2014	2184	2354	2524	2692	2860	3026	3192	3357	23
38	1846	2016	2187	2357	2526	2695	2862	3029	3195	3360	22
39	1848	2019	2190	2360	2529	2698	2865	3032	3198	3363	21
40	1850	2022	2193	2363	2532	2700	2868	3035	3201	3365	20
41	1853	2025	2196	2365	2535	2703	2871	3037	3203	3368	19
42	1856	2028	2198	2368	2538	2706	2874	3040	3206	3371	18
43	1859	2031	2201	2371	2540	2709	2876	3043	3209	3374	17
44	1862	2034	2204	2374	2543	2712	2879	3046	3212	3376	16
45	1865	2036	2207	2377	2546	2714	2882	3049	3214	3379	15
46	1868	2039	2210	2380	2549	2717	2885	3051	3217	3382	14
47	1870	2042	2213	2381	2552	2720	2887	3054	3220	3385	13
48	1873	2045	2216	2385	2555	2723	2880	3057	3223	3387	12
49	1876	2048	2218	2388	2557	2726	2893	3060	3225	3390	11
50	1879	2051	2221	2391	2560	2729	2896	3062	3228	3393	10
51	1882	2053	2224	2394	2563	2731	2899	3065	3231	3396	9
52	1885	2056	2227	2397	2566	2734	2901	3068	3234	3398	8
53	1888	2059	2230	2399	2568	2737	2904	3071	3236	3401	7
54	1890	2062	2232	2402	2571	2740	2907	3073	3239	3404	6
55	1894	2065	2235	2405	2574	2743	2910	3076	3242	3406	5
56	1896	2068	2238	2406	2577	2745	2913	3079	3245	3409	4
57	1899	2070	2241	2411	2580	2748	2915	3082	3248	3412	3
58	1902	2073	2244	2414	2583	2751	2918	3085	3250	3415	2
59	1905	2076	2247	2416	2585	2754	2921	3087	3253	3417	1
60	1908	2079	2249	2419	2588	2756	2924	3090	3256	3420	0
	79	78	77	76	75	74	73	72	71	70	M

A Table of Sines.

The Degrees of the Quadrant.

M.	20	21	22	23	24	25	26	27	28	29	M.
1	3423	3586	3748	3910	4070	4229	4386	4541	4697	4851	59
2	3426	3589	3751	3913	4073	4231	4389	4545	4700	4853	58
3	3428	3592	3754	3915	4075	4234	4391	4548	4702	4856	57
4	3431	3594	3757	3918	4078	4236	4394	4550	4705	4858	56
5	3434	3597	3759	3921	4081	4239	4396	4553	4707	4861	55
6	3437	3600	3762	3923	4083	4242	4399	4555	4710	4863	54
7	3439	3603	3765	3926	4086	4245	4402	4558	4713	4866	53
8	3442	3605	3768	3929	4089	4247	4404	4561	4715	4868	52
9	3445	3608	3770	3931	4091	4250	4407	4563	4718	4871	51
10	3447	3611	3773	3934	4094	4252	4410	4566	4720	4873	50
11	3450	3613	3776	3937	4096	4255	4412	4568	4723	4876	49
12	3453	3616	3778	3939	4099	4258	4415	4571	4725	4878	48
13	3456	3619	3781	3942	4102	4260	4418	4573	4728	4881	47
14	3458	3622	3784	3945	4104	4263	4420	4576	4731	4883	46
15	3461	3624	3786	3947	4107	4266	4423	4579	4733	4886	45
16	3464	3627	3789	3950	4110	4268	4425	4581	4736	4888	44
17	3467	3630	3792	3953	4112	4271	4428	4584	4738	4891	43
18	3469	3632	3794	3955	4115	4274	4431	4586	4741	4893	42
19	3472	3635	3797	3958	4118	4276	4433	4589	4743	4896	41
20	3475	3638	3800	3961	4120	4279	4436	4592	4746	4898	40
21	3477	3641	3803	3963	4123	4281	4438	4594	4748	4901	39
22	3480	3643	3805	3966	4126	4284	4441	4597	4751	4904	38
23	3483	3646	3808	3969	4128	4287	4444	4599	4754	4906	37
24	3486	3649	3811	3971	4131	4289	4446	4602	4756	4909	36
25	3488	3651	3813	3973	4134	4292	4449	4604	4759	4911	35
26	3491	3654	3816	3977	4136	4295	4451	4607	4761	4914	34
27	3494	3657	3819	3979	4139	4297	4454	4610	4764	4916	33
28	3497	3660	3821	3982	4142	4300	4457	4612	4766	4919	32
29	3499	3662	3824	3985	4144	4302	4459	4616	4769	4921	31
30	3502	3665	3827	3987	4147	4305	4462	4619	4771	4923	30
	69	68	67	66	65	64	63	62	61	60	M

A Table of Sines.

The Degrees of the Quadrant.

M	20	21	22	23	24	25	26	27	28	29	′
31	3503	3668	3829	3990	4149	4308	4464	4620	4774	4927	29
32	3507	3670	3832	3993	4152	4310	4467	4623	4777	4929	28
33	3510	3673	3835	3995	4155	4313	4470	4625	4779	4932	27
34	3513	3676	3837	3998	4157	4316	4472	4628	4782	4934	26
35	3516	3676	3840	4001	4160	4318	4475	4630	4784	4937	25
36	3518	3681	3843	4003	4163	4321	4478	4633	4787	4939	24
37	3521	3684	3846	4006	4165	4324	4480	4635	4789	4942	23
38	3524	3687	3848	4009	4168	4326	4483	4638	4792	4944	22
39	3527	3685	3851	4012	4171	4329	4485	4641	4794	4947	21
40	3529	3692	3854	4014	4173	4331	4488	4643	4797	4949	20
41	3532	3695	3856	4017	4176	4334	4490	4646	4799	4952	19
42	3535	3697	3859	4019	4178	4336	4493	4648	4802	4954	18
43	3537	3700	3862	4022	4181	4339	4496	4651	4805	4957	17
44	3540	3703	3864	4025	4184	4342	4498	4653	4807	4960	16
45	3543	3706	3867	4028	4186	4344	4501	4656	4810	4962	15
46	3546	3708	3870	4030	4189	4347	4503	4659	4812	4965	14
47	3548	3711	3872	4033	4192	4350	4506	4661	4815	4967	13
48	3551	3714	3875	4035	4194	4352	4509	4664	4817	4970	12
49	3554	3716	3878	4038	4197	4355	4511	4666	4820	4972	11
50	3556	3719	3880	4041	4200	4357	4514	4669	4822	4975	10
51	3559	3722	3883	4043	4202	4360	4516	4671	4825	4977	9
52	3562	3724	3886	4046	4205	4363	4519	4674	4828	4980	8
53	3565	3727	3888	4049	4208	4365	4522	4677	4830	4982	7
54	3567	3730	3891	4051	4210	4368	4524	4679	4833	4985	6
55	3570	3732	3894	4054	4213	4371	4527	4682	4836	4987	5
56	3573	3735	3896	4057	4216	4373	4529	4684	4838	4990	4
57	3575	3738	3899	4059	4218	4376	4532	4687	4840	4992	3
58	3578	3741	3902	4060	4221	4378	4535	4689	4843	4995	2
59	3581	3743	3905	4065	4224	4381	4537	4692	4845	4997	1
60	3584	3746	3908	4067	4226	4384	4540	4695	4848	5000	0
	69	68	67	66	65	64	63	62	61	60	M

A Table of Sines.

The Degrees of the Quadrant.

M	30	31	32	33	34	35	36	37	′
1	5002	5153	5302	5449	5594	5738	5880	6020	59
2	5005	5155	5304	5451	5597	5740	5882	6023	58
3	5007	5158	5306	5454	5599	5743	5885	6025	57
4	5010	5160	5309	5456	5601	5745	5887	6027	56
5	5012	5163	5311	5458	5604	5748	5890	6030	55
6	5015	5165	5315	5461	5606	5750	5892	6032	54
7	5017	5168	5316	5463	5609	5752	5894	6035	53
8	5020	5170	5319	5466	5611	5755	5896	6037	52
9	5022	5173	5321	5468	5614	5757	5899	6039	51
10	5025	5175	5324	5471	5616	5759	5901	6041	50
11	5027	5178	5326	5473	5618	5762	5904	6044	49
12	5030	5180	5329	5476	5621	5764	5906	6046	48
13	5032	5183	5331	5478	5623	5767	5909	6048	47
14	5035	5185	5334	5480	5625	5769	5911	6051	46
15	5038	5188	5336	5483	5628	5771	5913	6053	45
16	5040	5190	5339	5485	5630	5774	5915	6055	44
17	5042	5193	5341	5488	5633	5776	5918	6057	43
18	5045	5195	5343	5490	5635	5778	5920	6060	42
19	5048	5198	5346	5493	5638	5781	5922	6062	41
20	5050	5200	5348	5495	5640	5783	5925	6064	40
21	5053	5203	5351	5497	5642	5785	5927	6067	39
22	5055	5205	5353	5500	5645	5788	5929	6069	38
23	5058	5208	5356	5502	5647	5790	5932	6071	37
24	5060	5210	5358	5505	5650	5793	5934	6074	36
25	5063	5213	5361	5507	5652	5795	5936	6076	35
26	5065	5215	5364	5509	5654	5797	5939	6078	34
27	5068	5217	5366	5512	5657	5800	5941	6081	33
28	5070	5220	5368	5514	5659	5802	5943	6083	32
29	5073	5223	5370	5517	5662	5805	5946	6085	31
30	5075	5225	5372	5519	5664	5807	5949	6088	30
M	59	58	57	56	55	54	53	52	M

A Table of Sines.

The Degrees of the Quadrant.

M.	30	31	32	33	34	35	36	37	M.
31	5078	5127	5375	5522	5667	5809	5950	6090	29
32	5080	5230	5378	5524	5669	5812	5953	6092	28
33	5083	5232	5380	5527	5671	5814	5955	6094	27
34	5085	5235	5383	5529	5677	5816	5956	6097	26
35	5088	5237	5385	5531	5676	5819	5960	6099	25
36	5090	5240	5388	5534	5678	5821	5962	6101	24
37	5093	5243	5390	5536	5680	5823	5964	6104	23
38	5095	5245	5393	5539	5683	5826	5967	6106	22
39	5098	5247	5395	5541	5685	5828	5965	6108	21
40	5100	5250	5397	5543	5687	5831	597C	6110	20
41	5103	5252	5400	5546	5690	5833	5972	6114	19
42	5105	5255	5402	5548	5693	5835	5975	6117	18
43	5108	5257	5404	5551	5695	5838	5978	6119	17
44	5110	5260	5407	5553	5697	5840	598c	6121	16
45	5113	5262	5410	5556	5700	5842	5982	6123	15
46	5115	5265	5412	5558	5702	5845	5985	6124	14
47	5118	5267	5415	5560	5705	5847	5988	6127	13
48	5120	5269	5417	5563	5707	5849	5990	6129	12
49	5123	5272	5419	5565	5709	5852	5992	6131	11
50	5127	5274	5422	5568	5712	5854	5994	6134	10
51	5128	5277	5424	5570	5714	5856	5997	6136	9
52	5130	5279	5427	5573	5717	5859	5999	6138	8
53	5133	5282	5429	5575	5719	5861	6002	6140	7
54	5135	5284	5431	5577	5721	5864	6004	6143	6
55	5138	5287	5434	5580	5724	5866	6006	6145	5
56	5140	5289	5437	5583	5726	5868	6009	6147	4
57	5143	5293	5439	5585	5729	5871	6011	6149	3
58	5145	5294	5441	5587	5731	5873	6013	6152	2
59	5148	5297	5444	5589	5733	5875	6016	6154	1
60	5150	5299	5446	5592	5736	5878	6018	6156	0
M.	59	58	57	56	55	54	53	52	M.

A Table of Sines.

The Degrees of the Quadrant.

M	38	39	40	41	42	43	44	45	′
1	6159	6295	6430	6563	6694	6822	6949	7073	59
2	6161	6298	6432	6565	6696	6824	6951	7075	58
3	6163	6300	6434	6567	6698	6826	6953	7077	57
4	6166	6302	6437	6569	6700	6828	6955	7079	56
5	6168	6304	6439	6571	6702	6831	6957	7081	55
6	6170	6307	6441	6574	6704	6833	6959	7083	54
7	6173	6309	6443	6576	6706	6835	6961	7085	53
8	6175	6311	6446	6578	6708	6837	6963	7087	52
9	6177	6313	6448	6580	6711	6839	6965	7089	51
10	6179	6316	6450	6583	6713	6841	6967	7092	50
11	6182	6318	6452	6585	6715	6843	6969	7094	49
12	6184	6320	6454	6587	6717	6845	6972	7096	48
13	6186	6322	6457	6589	6719	6848	6974	7098	47
14	6189	6325	6459	6591	6721	6850	6976	7100	46
15	6191	6327	6461	6593	6724	6852	6978	7102	45
16	6193	6329	6463	6596	6726	6854	6980	7104	44
17	6195	6331	6466	6598	6728	6856	6982	7106	43
18	6198	6335	6468	6600	6730	6858	6984	7108	42
19	6200	6336	6470	6602	6732	6860	6986	7110	41
20	6202	6338	6472	6604	6734	6862	6988	7112	40
21	6205	6340	6474	6606	6736	6864	6990	7114	39
22	6207	6343	6477	6609	6738	6867	6992	7116	38
23	6209	6345	6479	6611	6741	6869	6994	7118	37
24	6211	6347	6481	6613	6743	6871	6997	7120	36
25	6213	6349	6483	6615	6745	6874	6999	7122	35
26	6216	6352	6486	6617	6747	6875	7001	7124	34
27	6218	6354	6488	6619	6745	6877	7003	7126	33
28	6220	6356	6490	6622	6752	6879	7005	7128	32
29	6223	6358	6492	6624	6754	6881	7007	7130	31
30	6225	6361	6494	6626	6756	6884	7009	7132	30
M	51	50	49	48	47	46	45	44	M

A Table of Sines.

The Degrees of the Quadrant.

M.	38	39	40	41	42	43	44	45	M.
31	6227	6365	6497	6628	6758	6886	7011	7134	29
32	6230	6367	6499	6630	6760	6888	7013	7136	28
33	6231	6368	6501	6633	6762	6890	7015	7139	27
34	6234	6370	6503	6635	6764	6892	7017	7141	26
35	6236	6372	6505	6637	6766	6894	7019	7143	25
36	6239	6374	6508	6639	6769	6896	7021	7145	24
37	6241	6376	6510	6641	6771	6898	7023	7147	23
38	6243	6379	6512	6644	6773	6900	7026	7149	22
39	6245	6381	6514	6646	6775	6902	7028	7151	21
40	6248	6383	6516	6648	6777	6905	7030	7153	20
41	6250	6385	6519	6650	6779	6907	7032	7155	19
42	6252	6387	6521	6652	6781	6909	7034	7157	18
43	6255	6390	6523	6654	6783	6911	7036	7159	17
44	6257	6392	6525	6657	6786	6913	7038	7161	16
45	6259	6394	6527	6659	6788	6915	7040	7163	15
46	6261	6396	6530	6661	6790	6917	7042	7165	14
47	6264	6399	6532	6663	6792	6919	7044	7167	13
48	6266	6401	6534	6665	6794	6921	7046	7169	12
49	6268	6403	6536	6667	6796	6923	7048	7171	11
50	6270	6405	6539	6670	6799	6925	7050	7173	10
51	6273	6408	6541	6672	6801	6928	7052	7175	9
52	6275	6410	6543	6674	6803	6930	7054	7177	8
53	6277	6412	6545	6676	6805	6932	7057	7179	7
54	6279	6414	6547	6678	6807	6934	7059	7181	6
55	6282	6417	6550	6680	6809	6936	7061	7183	5
56	6284	6419	6552	6683	6811	6938	7063	7185	4
57	6286	6421	6554	6685	6813	6940	7065	7187	3
58	6289	6423	6556	6687	6816	6942	7067	7189	2
59	6291	6426	6558	6689	6818	6944	7069	7191	1
60	6293	6428	6560	6691	6820	6946	7071	7193	0
M.	51	50	49	48	47	46	45	44	M.

A Table of Sines.

The Degrees of the Quadrant.

M.	46	47	48	49	50	51	52	53	
1	7195	7315	7433	7549	7662	7773	7882	7988	59
2	7198	7317	7435	7551	7664	7775	7884	7990	58
3	7199	7319	7437	7553	7666	7777	7885	7992	57
4	7201	7321	7439	7555	7668	7779	7887	7993	56
5	7203	7323	7441	7557	7670	7781	7889	7995	55
6	7205	7325	7443	7559	7672	7782	7891	7997	54
7	7207	7327	7445	7560	7673	7784	7893	7998	53
8	7209	7329	7447	7562	7675	7786	7894	8000	52
9	7211	7331	7449	7564	7677	7788	7896	8002	51
10	7213	7334	7451	7566	7679	7790	7898	8004	50
11	7215	7335	7453	7568	7681	7791	7900	8005	49
12	7218	7337	7455	7570	7683	7793	7901	8007	48
13	7220	7339	7457	7572	7685	7795	7903	8009	47
14	7222	7341	7459	7574	7687	7797	7905	8011	46
15	7224	7343	7461	7576	7689	7799	7907	8012	45
16	7226	7345	7463	7577	7690	7801	7909	8014	44
17	7228	7347	7464	7579	7692	7803	7910	8016	43
18	7230	7349	7466	7581	7694	7804	7912	8018	42
19	7232	7351	7468	7583	7696	7806	7914	8019	41
20	7234	7353	7470	7585	7698	7808	7916	8021	40
21	7236	7355	7472	7587	7700	7810	7918	8023	39
22	7238	7357	7474	7589	7701	7811	7919	8025	38
23	7240	7359	7476	7591	7703	7813	7921	8026	37
24	7242	7361	7478	7593	7705	7815	7923	8028	36
25	7244	7362	7480	7595	7707	7817	7925	8030	35
26	7248	7365	7482	7596	7709	7820	7927	8032	34
27	7246	7367	7484	7598	7711	7821	7928	8033	33
28	7250	7369	7486	7600	7712	7822	7930	8035	32
29	7252	7371	7488	7602	7714	7824	7932	8037	31
30	7254	7373	7490	7604	7716	7826	7933	8038	30
	43	42	41	40	39	38	37	36	M.

A Table of Sines.

The Degrees of the Quadrant.

M	46	47	48	49	50	51	52	53	
31	7256	7375	7491	7606	7718	7828	7935	8040	29
32	7258	7377	7492	7608	7720	7830	7937	8042	28
33	7260	7379	7495	7610	7722	7832	7939	8044	27
34	7262	7381	7497	7612	7724	7833	7941	8045	26
35	7264	7382	7499	7614	7725	7835	7943	8047	25
36	7266	7384	7501	7615	7727	7837	7944	8049	24
37	7268	7386	7503	7617	7729	7839	7946	8051	23
38	7270	7388	7505	7619	7731	7840	7948	8052	22
39	7272	7390	7507	7621	7733	7842	7949	8054	21
40	7274	7392	7509	7623	7735	7844	7951	8056	20
41	7276	7394	7511	7625	7737	7846	7953	8058	19
42	7278	7396	7513	7627	7739	7848	7955	8059	18
43	7280	7397	7514	7629	7740	7845	7956	8061	17
44	7282	7398	7516	7630	7742	7851	7958	8063	16
45	7284	7402	7518	7632	7744	7853	7960	8064	15
46	7286	7404	7520	7634	7746	7855	7962	8066	14
47	7288	7406	7522	7636	7748	7857	7963	8068	13
48	7290	7408	7524	7638	7750	7858	7965	8070	12
49	7292	7410	7526	7640	7751	7860	7967	8071	11
50	7294	7412	7528	7642	7753	7862	7969	8073	10
51	7296	7414	7530	7644	7755	7864	7970	8075	9
52	7298	7416	7532	7645	7757	7866	7972	8076	8
53	7300	7418	7534	7647	7759	7867	7974	8078	7
54	7301	7420	7536	7649	7760	7869	7976	8080	6
55	7303	7422	7537	7651	7762	7871	7977	8082	5
56	7305	7424	7539	7653	7764	7873	7979	8083	4
57	7307	7426	7541	7655	7766	7875	7981	8085	3
58	7309	7428	7543	7657	7768	7876	7983	8087	2
59	7311	7429	7545	7659	7770	7878	7985	8088	1
60	7313	7431	7547	7660	7771	7880	7986	8090	0
	43	42	41	40	39	38	37	36	M

A Table of Sines.

The Degrees of the Quadrant.

M.	54	55	56	57	58	59	60	
1	8092	8193	8292	8388	8482	8573	8662	59
2	8094	8195	8294	8390	8483	8575	8663	58
3	8095	8197	8295	8391	8485	8576	8665	57
4	8097	8198	8297	8393	8487	8578	8666	56
5	8099	8200	8298	8395	8489	8579	8668	55
6	8100	8201	8300	8396	8490	8581	8669	54
7	8102	8203	8302	8398	8491	8582	8670	53
8	8104	8205	8304	8399	8493	8584	8672	52
9	8105	8206	8305	8401	8494	8585	8673	51
10	8107	8208	8307	8402	8496	8587	8675	50
11	8109	8210	8308	8404	8497	8588	8676	49
12	8111	8212	8310	8406	8499	8590	8678	48
13	8112	8213	8311	8407	3500	8591	8679	47
14	8114	8215	8313	8409	3502	8593	8681	46
15	8116	8216	8315	8410	8503	8594	8682	45
16	8117	8218	8316	8412	8504	8596	8684	44
17	8119	8220	8318	8414	8506	8597	8685	43
18	8121	8221	8319	8415	8507	8599	8687	42
19	8122	8223	8321	8417	8509	8600	8688	41
20	8124	8225	8323	8418	8511	8602	8690	40
21	8126	8226	8324	8420	8513	8603	8691	39
22	8128	8228	8326	8421	3514	8605	8692	38
23	8129	8230	8328	8423	8516	8606	8694	37
24	8131	8231	8329	8424	8517	8607	8695	36
25	8133	8233	8331	8426	8519	8608	8697	35
26	8134	8235	8332	8428	8520	8610	8698	34
27	8136	8236	8334	8429	8522	8612	8699	33
28	8138	8238	8336	8431	8523	8613	8701	32
29	8139	8240	8337	8432	8525	8615	8702	31
30	8141	8241	8339	8434	8526	8616	8704	30
M.	35	34	33	32	31	30	29	M

A Table of Sines.

The Degrees of the Quadrant.

M.	54	55	56	57	58	59	60	I.
31	8143	8243	8340	8435	8528	8618	8705	29
32	8144	8245	8342	8437	8529	8619	8706	28
33	8146	8246	8344	8438	8531	8621	8708	27
34	8148	8248	8346	8440	8532	8622	8709	26
35	8149	8249	8347	8442	8533	8623	8711	25
36	8151	8251	8348	8443	8536	8625	8712	24
37	8153	8253	8350	8445	8537	8627	8713	23
38	8155	8254	8352	8446	8539	8629	8715	22
39	8156	8256	8353	8448	8540	8630	8716	21
40	8158	8257	8355	8449	8541	8631	8718	20
41	8160	8259	8356	8451	8543	8633	8719	19
42	8161	8261	8358	8452	8545	8634	8720	18
43	8163	8263	8360	8454	8546	8636	8722	17
44	8165	8264	8361	8455	8548	8637	8724	16
45	8166	8266	8362	8457	8549	8638	8725	15
46	8168	8267	8364	8458	8551	8640	8726	14
47	8170	8269	8366	8460	8552	8641	8728	13
48	8171	8271	8367	8462	8554	8643	8729	12
49	8172	8272	8369	8463	8555	8644	8731	11
50	8174	8274	8371	8465	8557	8646	8732	10
51	8176	8276	8372	8466	8558	8647	8733	9
52	8178	8277	8374	8468	8560	8648	8735	8
53	8180	8279	8375	8470	8561	8650	8736	7
54	8181	8281	8377	8471	8563	8651	8738	6
55	8183	8282	8379	8473	8565	8653	8739	5
56	8185	8284	8380	8474	8566	8655	8740	4
57	8186	8285	8382	8476	8567	8656	8742	3
58	8188	8287	8383	8477	8568	8657	8743	2
59	8190	8289	8385	8479	8570	8659	8745	1
60	8191	8290	8387	8480	8572	8660	8746	0
	35	34	33	32	31	30	29	M

A Table of Sines.

The Degrees of the Quadrant.

M	61	62	63	64	65	66	67	
2	8749	8832	8913	8990	9065	9138	9207	58
4	8752	8835	8915	8993	9068	9140	9209	56
6	8755	8838	8918	8995	9070	9142	9212	54
8	8758	8841	8921	8998	9073	9145	9214	52
10	8760	8843	8923	9000	9075	9147	9216	50
12	8763	8846	8926	9003	9078	9149	9218	48
14	8766	8849	8928	9006	9080	9152	9221	46
16	8769	8852	8931	9008	9083	9154	9223	44
18	8771	8854	8934	9011	9085	9156	9225	42
20	8774	8857	8936	9013	9087	9159	9228	40
22	8777	8860	8939	9016	9090	9161	9230	38
24	8780	8862	8941	9018	9092	9164	9232	36
26	8783	8865	8944	9021	9095	9166	9234	34
28	8785	8867	8947	9023	9098	9168	9236	32
30	8788	8870	8949	9026	9100	9171	9239	30
32	8791	8873	8952	9028	9102	9173	9241	28
34	8794	8875	8954	9031	9104	9175	9243	26
36	8796	8878	8957	9033	9107	9178	9245	24
38	8799	8880	8760	9036	9109	9180	9247	22
40	8802	8883	8962	9038	9112	9182	9250	20
42	8805	8886	8964	9041	9114	9184	9252	18
44	8808	8889	8967	9043	9117	9187	9254	16
46	8810	8891	8970	9046	9119	9189	9256	14
48	8813	8894	8972	9048	9121	9191	9259	12
50	8816	8897	8975	9051	9123	9194	9261	10
52	8819	8899	8978	9054	9126	9196	9263	8
54	8821	8902	8980	9056	9128	9199	9265	6
56	8824	8905	8983	9059	9131	9201	9268	4
58	8827	8907	8985	9061	9133	9203	9270	2
60	8830	8910	8988	9064	9135	9205	9272	0
M	28	27	26	25	24	23	22	M

A Table of Sines.

The Degrees of the Quadrant.

M	68	69	70	71	72	73	74	M
2	9272	9338	9398	9457	9512	9565	9614	58
4	9276	9340	9401	9459	9514	9566	9616	56
6	9278	9342	9403	9461	9516	9568	9617	54
8	9280	9344	9405	9463	9518	9570	9619	52
10	9283	9346	9407	9465	9519	9571	9620	50
12	9285	9348	9409	9466	9521	9573	9622	48
14	9287	9351	9411	9468	9523	9575	9624	46
16	9289	9452	9413	9470	9525	9577	9625	44
18	9291	9354	9415	9472	9527	9578	9627	42
20	9293	9356	9417	9474	9528	9580	9628	40
22	9296	9358	9419	9476	9530	9581	9630	38
24	9298	9360	9420	9478	9532	9583	9632	36
26	9300	9363	9422	9480	9534	9585	9633	34
28	9302	9365	9424	9481	9535	9586	9635	32
30	9304	9367	9426	9483	9537	9588	9636	30
32	9306	9369	9428	9485	9539	9590	9638	28
34	9308	9371	9430	9487	9540	9591	9639	26
36	9310	9373	9432	9489	9542	9593	9641	24
38	9313	9375	9434	9491	9544	9595	9642	22
40	9315	9377	9436	9492	9546	9596	9644	20
42	9317	9380	9438	9494	9548	9598	9645	18
44	9319	9381	9440	9496	9549	9600	9647	16
46	9321	9383	9441	9498	9551	9601	9648	14
48	9323	9385	9443	9500	9553	9603	9650	12
50	9325	9387	9446	9501	9554	9604	9651	10
52	9327	9389	9447	9503	9556	9606	9653	8
54	9329	9391	9445	9505	9558	9608	9655	6
56	9331	9393	9451	9507	9559	9609	9656	4
58	9333	9395	9453	9509	9561	9611	9658	2
60	9336	9397	9455	9510	9563	9613	9659	0
D.	21	20	19	18	17	16	15	M

A Table of Sines.

The Degrees of the Quadrant.

M.	75	76	77	78	79	80	81	82	°
5	9663	9706	9747	9784	9819	9850	9879	9905	55
10	9667	9710	9750	9787	9822	9853	9881	9907	50
15	9670	9713	9753	9790	9824	9855	9884	9909	45
20	9674	9717	9756	9793	9827	9858	9886	9911	40
25	9678	9720	9760	9796	9830	9860	9888	9912	35
30	6981	9724	9763	9799	9832	9863	9890	9914	30
35	9685	9727	9766	9802	6835	9865	9892	9916	25
40	9689	9730	9769	9805	9838	9868	9895	9918	20
45	9692	9734	9772	9808	9840	9870	9896	9920	15
50	9696	9737	9775	9811	9842	9872	9898	9922	10
55	9699	9740	9777	9813	9846	9874	9900	9924	5
60	9703	9745	9781	9816	9848	9877	9903	9925	0
	14	13	12	11	10	9	8	7	M.

The Degrees of the Quadrant.

M	83	84	85	86	87	88	89	
5	9927	9947	9963	9977	9987	9994	9998	55
10	9929	9948	9964	9978	9988	9995	9998	50
15	9931	9950	9965	9978	9988	9995	9998	45
20	9932	9951	9967	9979	9989	9996	9999	40
25	9934	9952	9968	9980	9990	9996	9999	35
30	9936	9954	9969	9981	9990	9996	9999	30
35	9937	9955	9970	9980	9991	9997	9999	25
40	9939	9957	9971	9982	9992	9997	9999	20
45	9940	9958	9972	9984	9992	9998	9999	15
50	9942	9959	9973	9981	9993	9998	10000	10
55	9944	9960	9975	9985	9993	9998	10000	5
60	9945	9962	9976	9985	9994	9998	10000	0
	6	5	4	3	2	1	0	M.

The Extraction of Roots.

IT is not unnecessary, before we do enter into this order and method of teaching how to extract a *Root*, to shew their divers Kinds and Definitions: Therefore you must know that of *Roots* there are sundry sorts according to the quantities from which they are derived, as the *Square*, *Cube*, *Squared Square*, *Surdsolids*, &c. for the numbers receive their Names of the said quantities, every quantity having his *Root*, which may be called the first quantity, because it is the side or beginning of the quantity whereunto it is set. Numbers of the second quantity are called *Squares*, of the third *Cubes*, of the fourth *squared Squares*, as before; wherein you may proceed infinitely if you will; but you shall seldom or never have use for the Extraction of the *Root* of any quantity more than *Squares* and *Cubes*. A *Square* Number is the Product of any Number multiplied in it self, and the *Root* thereof is the Multiplier, whereby the same square Number is produced: For example, 4 is a square Number coming of the Multiplication of 2 in it self, which is the *Root* thereof.

A Cubick Number is the Product of a Number multiplied into it self, and the same Product multiplied again by the first Number: As 2 multiplied by it self is 4, that Product multiplied again by 2, the first Number, makes 8, which is a Cubick Number, and the *Root* thereof is 2.

A squared Square Number is produced of 3 Multiplications: First, any Number multiplied by it self, makes a *Square* Number; that Product again by the first Root or Multiplier, makes a Cubick Number; and lastly, that Product again by the first Multiplier or Root, produceth a squared Square Number: as 2 multiplied in it self makes 4 a square Number, that again by 2, makes 8, which is a Cubick Number, and then that Product again by 2, produceth 16, which is a squared Square Number, and the *Root* thereof is 2. A Surdsolid Number is the Product of a Number multiplied 4 times by the *Root* thereof, as 32 is a Surdsolid Number, the Root whereof is 2: For 2 multiplied in it self is 4, that multiplied again by 2, is 8; the same Product again by 2, makes 16: and lastly, the same Product multiplied by the first Number 2, makes 32. Therefore 32 is a Surdsolid Number, and the Number 2, whereby the said Number is produced, is the Surdsolid *Root* to the said Number: and thus multiplying the last Product by the first Number or Root, you may proceed infinitely, but more than these are needless, and as I said before, without any great or common use.

Now for the finding the *Root*, it must be done according to the quantity whereof it taketh Denomination, whether it be of a Square or Cube, or otherwise, which known, let us proceed to the working thereof.

And

For the more ready extracting the Square or Cube Root, It is requisite to learn by Memory the just Square and Cube Numbers of the 9 Digits.

Squares.		*Cubes.*	
1	01	1	001
2	04	2	008
3	09	3	027
4	16	4	064
5	25	5	125
6	36	6	216
7	49	7	343
8	64	8	512
9	81	9	729

Also for the square Root is 1 Number required, which is 20; for the Cube 2 Numbers, which are 300 and 30, to be added to each Quantity.

Extraction of the Square Root.

LET 104976 be a given Number, whereof I would know the square Root, (*viz.*) that Number being multiplied in it self, will produce the forsaid Number of 104976. Therefore, first I set down the said Number, and under the last Figure to the right-hand, (in this Example 6) I put a Prick, another under 9, and another under 0, leaving one Figure betwixt every Prick: Which done, and the Quotient drawn, the Number given will stand thus: whereby I see the Root of the said Number must consist of 3 Figures, it having 3 Pricks under it: Thus I see for the greatest square Number in 10, it being the Number belonging to the first Prick towards the left-hand, that I find to be 9, which is produced of 3 multiplied squarely, therefore I put 3 in the Quotient for the first Figure of the Root, and the Square thereof being 9, I subtract from 10, the Number over the first Prick, and there rests 1. The order of which Work will stand thus; where the Figures over the first Prick are cancelled, there is 3 in the Quotient for the Figure of the Root, and rests 1, which with the Figures betwixt it and the next Prick, makes 149, for the Number of the second Prick.

```
104976(3
 9
 125
```

Now for the second Figure of the Root, I multiply 3, the Root already found, by 20, and the Product is 60; that I seek how often I may take from 149, the Number over the 2 Pricks, which I may do 2 times, for 2 times 60 is 120, whereunto the Square of 2, which is 4, being added, makes 124; that subtracted from 149 leaves 25; therefore I put 2 in the Quotient for the 2d Figure of the Root, and cancelling the Figures over the 2d Prick, the Remainder being put over it, the working hereof will stand in this order; where you see the Quotient is 32 for the two first Figures of the Root, and the Figures of the 2 first Pricks being

```
104976(32
 9
 125
 124
```

```
20
 3
60
 2
120
 4
124
```

being cancelled; there rests 25 which with the other Figures betwixt them, and the third and last Prick, makes 2576, for the Number over the last Prick.

```
 124
204976(324
 9
 125
  2576
        32
        20
       640
         4
      2560
        16
      2576
       324
       324
      1296
      684
     972
    104976
```

Now therefore to find the last Figure of the Root, I multiply the Root already found, that is to say, 32 by 20, and the Product thereof is 640, that I seek how often it may be taken out of 2576, the Number over the last Prick, which may be done 4 times, for 4 times 640 is 2560, whereunto if I add the Square of 4, there will amount 2576; which because it may be taken from the Number remaining over the last Prick, I put 4 in the Quotient for the last Figure of the Root, and subtracting the former Product of 2576, from the Number over the last Prick, which is likewise 2576, there will rest nothing, therefore I cancel those Figures likewise, and thereby conclude, 104976 to be a square Number, and 324 to be the Root thereof.

The proof whereof is by multiplying the Root into it self squarely: For if you multiply 234 by 324, the Product will be 104976, which was the first given Number, and shews the Number to be a square Number.

I doubt not but to any indifferent Understanding, this Example will suffice, as well as if I contrived a whole Volume thereof, when the given Number is a perfect square Number. But if the Number given be not a square Number, to find the nearest Root thereof, the Rule is thus: Double the Remainder of the Numerator, and the Quadruple, *viz.* Multiply the Root by 4, and thereto add 1 for the Denominator to the said Numerator, as in this Example; To extract the nearest square Root of 18, I find 4 to be in the Quotient, and 2 remaining, which 2 being doubled, makes 4 for the Numerator, and 4 the Root being multiplied by 4; makes 16, and 1 added therewith makes 17 for the Denominator: whereby I say, that $4\frac{4}{17}$ is the square Root of 18 *ferè*, which may be proved thus: if you reduce $4\frac{4}{17}$ into one common Denomination, and then multiply them squarely, the Product will be $17\frac{15}{16}$ which is but $\frac{1}{16}$ too little.

```
(2
18(4 4/17
16
```

How to extract the Cube Root.

Thus having declared the Order how to extract the square Root of any Number, it resteth now that I shew the manner of Extracting the Cube Root of any Number: The principal Uses thereof you shall find in the general Practice of the Mathematicks: But some few Uses of them I have inserted after the extraction of the Cube Root.

Extraction

Extraction of the Cube Root.

LET 12487168 be a given Number, whereof I would extract the Cube Root. First, having prickt every third Figure, and drawn a Quotient for the Root, as in the Margin, I see the Root must consist of three Figures, so many Pricks being under the Number given. For the finding of which Figures, I seek first the greatest Cube Number in 12, the Number over the first Prick, which is 8, the Root whereof being 2, I put in the Quotient, and setting 8, the Cube thereof, under 12, and subtracting it from them, there remains 4.

4	
12487168	(2
8	

Then for the second Figure of the Root, I put down 300 and 30, the numbers of the Cube Root, and under 30 I set 2, the first Figure of the Root found, and under 300 I set 4, which is the Square thereof; and multiply 300 by 4, the Product is 1200: Then I consider how often I may take this number 1200 from the number on the second Prick, which is 4487, and I find it may be taken three times, therefore I put 3 in the Quotient for the second Figure of the Root, and likewise under the number 300, and the Square thereof, which is 9, I put under 30; and the Cube thereof, which is 27, I put to the right-hand of 30: Then I multiply all the numbers in the first Rank each by other, *viz.* 4 by 300, makes 1200, and that by 3, makes 3600, which I set by it self. Then I multiply 2 by 30, which makes 60, and that by 9, which makes 540, which I put under the other Product. Lastly, because 27 hath no number under it, I set it down under the two former Products, and adding them together, the Sum thereof is 4167, which I set in order under the Figures of the second Prick, and subtracting it from them, there remains 320 to be joined to the Number over the third Prick, which makes it 320168.

For the 2d Fig.

300	30	27
4	2	
1200	60	
3	9	
3600	540	
540		
27		
4167		
4320		

12487168	(23
8	
4167	

For the third Figure of the Root, I put down the two numbers 300 and 30 as before, and under 30 I put down 23, the Root already found; and under 300 the Square thereof, which is 529, then multiply 529 by 300, the Product is 158700; I find this may be taken twice out of the remaining Number of the Cube 320168, therefore I put 2 in the Quotient for the third Figure of the Root, and likewise set 2 under 300, and the Square thereof, which is 4, under 30, and the Cube thereof,

For the 3d Fig.

300	30	8
529	23	
157800	690	
2	4	

317400 2760
2760
8

320168
4320
12487168(232
8
4267
320168

which is 8, I put to the right-hand of 30. Then I multiply all the Numbers in each Row into one Product, *viz.* 529 by 300, makes 158700, and that again by 2, makes 317400, which I set by it self; then I multiply 23 by 30, which makes 690, and that again by 4, makes 2760, which I set under the former Product. Lastly, Because 8 hath no Number under it, I set it down under the other two Products, and casting up the Sum of all three, they make 320168, which taken from the Number over the last Prick, there rests nothing. So I conclude, that 232 is the Cube Root of the aforesaid Number 12487168.

Proof.

232
232
464
696
464
53824
232
107648
161472
107648
12487168

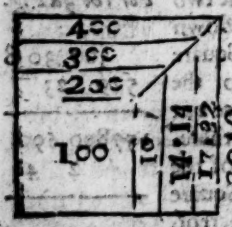
For the Proof thereof, multiply the said Number 232 cubically, as you see in the Margin, *viz.* 232 by 232, makes 53824, and that again by 232, makes just 12487168, the Number first proposed.

But when you have a Number given to extract the Cube Root, and the Number is not a perfect Cube Number; whereby you cannot come to any perfect Root thereof, but that there will remain some Fraction or broken Number after the Extraction; the manner to extract the Root of a Number not Cubical, as most Writers affirm, is thus:

The Difference between the Cubick Number of the Root, and the Cubick Number of a Number more than the Root by an Unity, shall be the Denominator: The Remainder also added to an Unity, is the Numerator to that Denominator.

Of the Use of the Square and Square-Roots.

First to make a Square, Two, Three, or Four, or any number of times bigger than another Square: Square the side thereof, which is the Content; which being doubled, trebled, or quadrupled, and the Root thereof extracted, shews the side of the Square desired.



Thus the side of a Square being 10, the Content is 100; the double thereof being 200, the Side or Root thereof will be found to be 14, 14 parts. The Treble thereof being 300, the Side or Root thereof is 17, 32 parts. The quadruple thereof being 400, the Root thereof is 20. Which tho but doubled to the first Side or Root 10, yet is four times the quantity.

Secondly,

Secondly, As you do by the Square, so you may do for the Circle, knowing either the Diameter, Semidiameter, or the Circumference thereof, square it; that is, multiply it in it self, and then double or treble, or quadruple the Number, and extract the Square Root thereof, so you shall have the Diameter or Circumference of a Circle that shall be 2, 3, or 4 times bigger than the other. Thus the Diameter of a Circle being 7 Inches, the Square thereof is 49, the double thereof is 98, the Root thereof is 9, 90 parts *fere*, the treble thereof, or 49 by 3 is 147, and the Root of that 12, 11 Parts. The quadruple thereof is 196, and the Root thereof 14, which is double to the first Diameter, and 4 times in value. And so if the Compass of a Cable be 7 Inches, one of 14 Inches compass shall fathom for fathom weigh 4 times the weight. And so likewise if it be but 3 Inches and an half in Compass, which is but the half of 7 Inches, it shall be but a quarter of the Weight and Strength. And so you may find the Weight and Strength of any Cable or Hawser, by squaring the Compass thereof, and comparing it with another, whose Weight and Compass is known.

Thirdly, If you add the Squares of any two Numbers together, they will amount to the Square of the Slope-line, which shall make them stand at right Angles. Thus in any plain right-angled Triangle, having the Perpendicular and the Base, you may find the Slope-line.

For Example. Take these three small Numbers, 3, 4, and 5, (which are eminently known to make a right-angled Triangle, being found out long since by *Pythagoras*) having the two sides, 3 and 4, you may find the Slope-side to be 5. For the Square of 3 is 9, and the Square of 4 is 16; these two square Numbers added together, make 25, the square Root whereof is 5, which is the Length of the Slope-side. And so it will be in any other Triangle proportionably to the Sides thereof. And thus by the Longitude and Latitude of two Places, you may find their distance, as is shewed before, *pag.* 107, or 108.

9
16
25
5

Fourthly, Having the Slope-line of such a Triangle, and one of the other sides; to find the Base, work thus: Square the Slope-line, and likewise square the other side, and subtract the Square of the side, from the Square of the Slope-line, and there will remain the Square of the other side.

Thus

25
9
16
4
25
16
9
3

Thus for Example. The Slope-line being 5, the Square thereof is 25; and one of the Sides being 3, the Square thereof is 9; which subtracted from 25, there remains 16, which is the Square of 4, which is the other side. And so likewise if you subtract 16, which is the Square of the other side, from 25 the Square of the Slope-side, there will remain 9, which is the Square of 3 for the other side. This you may make good use of in Navigation and Surveying, to find out the Perpendicular and Sides of Triangles.

Lastly, As you may thus find the Sides of this right-angled Triangle, and so with a little more trouble you may find out the Sides of any Triangle; for the whole Canon of Sines, Tangents, and Secants, are made after this manner. But this may suffice for a taste of the use of the square Numbers, and their Roots.

The Use hereof is like the Use of the Squares, only what they perform in the Superficies of any Figure, these perform in the solid Body thereof.

1. If you would double the Cube, or make one cubical or solid Body, equal to any 2 lesser ones, take the side of each Cube, and multiply it cubically in it self; then add them together, and extract the Cubick Root from them, and that shall be the side of the Cube equal to them both. Thus if you have a Cube, that is 4 Inches or Feet on each side, and would have a Cube made as big again, multiply the side 4 by it self, it makes 16; and that again by 4, makes 64, the double whereof is 128, and the Cubick Root thereof is near 5 somewhat above it, for the Cube of 5 is 125; and more exactly the Cube Root of 128 is 5,01465 parts, and such a Cube shall be double to a Cube of 4 Inches. But if you double the side of the Cube, and so make it 8 every way, such a Cube shall be 8 times bigger than the number of 4; for 8 times 8 is 64, and 8 times 64 is 512, which is the content of the Cube of 8.

2. As it falls out in square Cubical Bodies, so likewise in round Bullets, or solid Globes; so that knowing the Weight of any Bullet, whose Diameter is known, you may know the Weight of another Bullet by its Diameter. Thus a Bullet of Iron of 4 Inches Diameter, weighs 9 Pounds; and a Bullet of 5 or a little more, shall weigh 18 Pounds, which is double the Weight; and a Bullet of 8 Inches Diameter shall weigh 72 Pounds, that is, 8 times the Weight. And so by cubing the Diameter of any Bullet, you may find the Weight thereof. As the Cube of 4, which is 64, to 9 pound Weight; so the Cube of 5, which is 125, to 17 pound, 58 parts. And so by the Weight, you may find the Diameter.

For Example; Suppose a Ship of 100 Tuns thus measured, was found to be 44 foot by the Keel, 20 foot on the Mid-ship Beam, 9 foot in the Hold,

Hold, and did rack with the Stem forwards 13 feet, and the Stern-Post did rack 7 foot afterwards, and you would desire to make another Ship of the same Mould, whose Burden should be double to it, that is, 200 Tuns. Multiply each of these Numbers cubically, as first, the length of the Keel being 44 foot, multiplied cubically, viz. 44 by 44, makes 1936, and that again by 44, makes 85184, which must be doubled, because the Ship is to be double the Burden of the other, so it makes 170868; then extract the Cube Root of this number, and it will yield 55 feet, 437000 parts *fere* of a Foot, which is 5 Inches, and almost ½ of an Inch. So do by all the other Dimensions of the Ship, to find the length of every of them; else you may, when you have many Lengths to find, having found out one of them, find the other by the Rule of Proportion. Thus having found the Keel to be 55 feet 437 parts, if you would find the length of the Mid-ship Beam proportionable to this, which in a Ship of 100 Tuns was 20 foot, say,

		feet. parts.	feet.	feet. par.
For the Mid-ship Beam 20 Foot.	As 44,	to 55. 437:	so 20,	to 25. 119
For the depth in the Hold, 9 Foot.	As 44,	to 55. 437:	so 9,	to 11. 339
For the racking of the Stem 13 Foot.	As 44,	to 55. 437:	so 13,	to 16. 379
For the Stern-post which did rack 7 foot afterward.	As 44,	to 55. 437:	so 7,	to 8. 819

Or else having found the proportion of one Cube to another, you may work by that; Thus,

The Cube Root of	1 being	1.000
	2 or the *double*	1.260
	3 or *triple*	1.444
	4 or *quadruple*	1.587
	5 or *quintuple*	1.710
	6 or *sextuple*	1.817
	7 or *septuple*	1.913
	8 or *octuple*	2.000

And thus the aforesaid Supposition being 44 by the Keel for a Ship of 100 Tuns, to find the length of the Keel for a Ship of 200, 300, &c.

For a Ship of	Tuns.		Feet.		Feet. Parts.
	200.	As 1.000,	to 44:	so 1.260,	to 55.440
	300.	As 1.000,	to 44:	so 1.444,	to 63.536
	400.	As 1.000,	to 44:	so 1.587,	to 69.828
	500.	As 1.000,	to 44:	so 1.710,	to 75.240
	600.	As 1.000,	to 44:	so 1.817,	to 79.948
	700.	As 1.000,	to 44:	so 1.913,	to 84.172
	800.	As 1.000,	to 44:	so 2.000,	to 88.000

To find the Latitude *and* Longitude *of Places.*

Suppose the Latitude and Longitude of *Silly* be desired.

Look in the Table for the Coast of *England* in the first Column, and in the second for *Silly*, over against which, in the third Column stands 50 deg. 12 min. and in the fourth N. which shews the Latitude of *Silly* to be 50 deg. 12 min. North; the last Column gives 22 deg. 10 min. which is the Longitude from S. *Michael* aforesaid.

To find the difference of Longitude *between two Places.*

Rule.

First, Look out their Longitude in the Table, subtract the lesser Longitude out of the greater, and if the Remainder be less than 180 deg. that is the Difference of Longitude; but if it be more, subtract it from 360 deg. and then the Remainder is the Difference of Longitude.

Example 1.

What is the Difference of Longitude between *Bermudus* and *Plymouth* in *New-England?*

	d.	m.
The Longitude of *Bermudus* is	326	00
The Longitude of *Plimouth* is	323	30
The Diff. of Longit. required	2	30

Example 2.

What is the Difference of Longitude between *Plimouth* in *New-England* and the *Lizard?*

	d.	m.
The Longitude of *Plimouth*	324	40
The Longitude of the *Lizard*	23	00
Greater than 180 deg.	301	40
Therefore subtract it from	360	00
The Diff. of Longit. required	58	20

To know whether the Difference of Longitude *between two Places be Easterly or Westerly.*

First, When the first Remainder is less than 180 deg. then being bound to the Place that hath the least Longitude, the Difference of Longitude is Westerly. But if bound to the place that hath the greater Longitude, it is Easterly.

Secondly, When the said first Remainder is greater than 110 deg. then if bound to the Place, having the greater Longitude, the Difference of Longitude is Westerly; if to that which hath the lesser, it is Easterly.

A Table of the Latitude and Longitude of Places: Beginning at the West end of St. Michaels.

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coast of Greenland and Nova Zembla.	Acluits Headland	79	35	N	40	50
	Fair Foreland	79	30	N	38	45
	Point Look-out	77	30	N	46	20
	Hope-Island	76	58	N	54	45
	Cherry Island	75	15	N	53	30
	Ice Point	77	10	N	94	30
	Cape Nassaw	76	30	N	93	00
	Admiralties Island	75	10	N	91	20
	Fretum Burrough	69	30	N	91	30
Coast of Lapland and Norway.	Cape Candenose	68	40	N	71	09
	Bergen	61	00	N	34	10
	Archangel	65	30	N	68	20
	Kildivia Isle	69	50	N	59	00
	North Cape	71	38	N	50	30
	Naze of Norway	58	11	N	34	30
Coast in the Sound.	Gottenberg	58	10	N	39	20
	Dantzick	54	23	N	48	00
	Stockholm	59	20	N	47	05
	Gotland Isle	58	20	N	47	15
	Copen-Haven	55	43	N	41	48
	Elsenore	56	40	N	41	50
	The Scaw	57	37	N	28	30
Coast of Holland and Flanders.	Hamburg	53	30	N	37	20
	The Texel	53	00	N	34	00
	Amsterdam	52	21	N	33	50
	Rotzrdam	51	59	N	33	40
	The Brill	51	55	N	32	57
	Calice	51	00	N	31	05

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Islands near the Coast of Scotland.	Kilda Island	58	02	N	20	50
	Lewis Island	58	30	N	21	30
	Fair Islands	51	43	N	28	50
	Shetland	60	22	N	26	30
	Isles of Orkney	58	50	N	25	20
	Buss Island	59	10	N	10	20
Coast of Scotland.	Merchants Foreland	63	36	N	10	10
	Langeness	67	20	N	14	11
	Snow Hill	65	40	N	338	00
Coast of England and Scotland.	London	51	32	N	29	00
	Buchaness	58	04	N	26	45
	Tinmouth	55	12	N	28	10
	Flambrough Head	54	10	N	29	08
	The Sporn	53	45	N	29	20
	Winterton Ness	52	54	N	30	45
	Orfordness	52	24	N	30	40
	North Foreland	51	36	N	30	35
	South Foreland	51	13	N	30	30
	Dover	51	12	N	30	29
	Dungeness	51	00	N	30	08
	Isle of Wight	50	37	N	37	30
	Portland	50	28	N	26	25
	The Start	50	10	N	24	55
	The Lizard	50	10	N	23	00
	Isles of Scilly	50	12	N	22	10
	Londeys Isle	51	18	N	24	15
	David's Head	52	05	N	23	35
	Brissel	51	28	N	26	15
Coast in the Irish Sea.	Holy Head	53	33	N	24	25
	Isle of Man	54	25	N	24	40
	Fair Foreland	55	15	N	22	30
	Black Rock	52	08	N	22	25
	Slins Head	53	02	N	20	00
	Blasques	52	05	N	19	25
	Cape Clear	51	03	N	20	00
	Old Head	51	28	N	20	30
	Dublin	53	20	N	22	30

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coast of *France*, *Spain* and *Portugal*.	*Seyn Head*	49	50	N	29	20
	Cape Hage	49	55	N	26	35
	Garnsey	49	35	N	26	05
	Jersey	49	30	N	26	30
	Ushant	48	35	N	23	00
	Breſt	48	30	N	23	10
	Bilboa	43	34	N	24	20
	Bourdeaux	45	30	N	27	30
	Cape Ortegal	44	04	N	19	40
	Cape Finiſterre	43	06	N	17	30
	Lisbon	38	40	N	18	05
	Cape Vincent	37	00	N	17	50
	Straits of Gibralter	35	50	N	21	15
Sea-Coaſts in the *Straits*.	*Cape de Gata*	36	35	N	27	40
	Cape Martin	38	34	N	30	20
	Marſeilles	43	20	N	34	40
	Genoa	44	27	N	39	00
	Rome	41	54	N	42	20
	Cape Spartaventura	37	34	N	45	15
	Cape Maria	39	40	N	47	30
	Naples	41	05	N	44	12
	Angello	41	19	N	39	40
	Legorn	43	18	N	39	50
	Venice	45	20	N	43	11
	Cape Mapatan	36	00	N	54	40
	Standeroon	36	56	N	57	00
	Cape Rusato	30	38	N	53	10
	Tunis	35	18	N	38	25
	Cape Tres Forcas	35	28	N	27	00
	Tangier	35	25	N	21	20
Iſlands in the *Straits*.	*Alboran*	37	53	N	27	15
	Formentara	38	45	N	32	40
	Ivica	39	06	N	31	00
	Majorca	39	39	N	32	30
	Minorca	39	56	N	33	50
	Cape Napali in Sardinia	39	10	N	38	30

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Islands in the Straits.	Cape Gorso in Corsica	42	52	N	039	20
	Malta	35	45	N	043	40
	Cape Pasero in Sicilia	36	33	N	044	20
	Messina	37	20	N	043	55
	Corfu	38	54	N	050	50
	Cephalonia	37	57	N	051	30
	Zant	36	42	N	051	40
	Candia City	34	40	N	054	50
	Rhodes	34	46	N	058	50
	West end of Cyprus	33	27	N	062	10
	East end of Cyprus	33	53	N	065	35
	Smyrna	38	40	N	058	10
	Constantinople	42	50	N	061	30
	Alexandria	30	28	N	063	20
Coast of Barbary and Guiny.	Cape Spartel	35	41	N	020	20
	Cape Cantin	32	30	N	016	00
	Cape de Geere	29	56	N	014	31
	Cape Bojador	27	09	N	009	53
	Cape Blanco	20	30	N	007	11
	Cape Verde	14	26	N	003	00
	River Gamboia	13	00	N	008	41
	Cape Roco	11	41	N	008	30
	Cape Monte	05	44	N	012	00
	Cape Palmas	04	07	N	017	50
	Cape Tres Puntas	04	15	N	023	25
	Cape Gorse	04	20	N	024	30
	Cape Formosa	04	20	N	032	25
	Thomas Island	00	10	N	034	05
	Cape Negro	16	00	N	037	55
	Cape Bona Esperance	34	30	N	045	15
Western Islands.	Flores	39	39	N	355	37
	Fyals	38	33	N	357	30
	S. George	39	10	N	358	10
	Tercera	39	56	N	358	56
	The West end of S. Michaels	37	54	N	000	00
	St Maries	37	15	N	901	05
	Gratiosa	39	40	N	358	05

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Canary Islands.	Ferro	27	53	N	005	35
	Palma	28	80	N	005	40
	Gomera	28	08	N	006	25
	Teneriff	28	42	N	008	00
	Madera	32	25	N	009	30
	Canaria	28	00	N	008	55
	Forteventura	28	06	N	011	41
	Lancerotta	28	30	N	012	35
Cape de Verde Islands.	Maio	14	49	N	311	17
	Fogo	14	28	N	359	41
	Jago	14	40	N	360	35
	Sall	16	50	N	361	44
	Anabona	01	35	S	031	50
	Ascension	08	00	S	014	40
	Hellena	16	00	S	023	25
	Hellena Nova	16	40	S	030	05
Coast in the East-Indies.	Cape Anguillea	34	58	S	046	50
	Cape Corientes	23	36	S	062	30
	Cape Sebastian	22	40	S	064	25
	Sophala Isles	21	00	S	064	20
	Cape Falco	08	30	S	069	40
	Magadoxa	02	35	N	072	43
	Socatera Isle	12	30	N	085	40
	Cape Dorfui	10	20	N	082	50
	Cape de Gardassin	12	15	N	082	55
	Cape Rasolgate	22	26	N	091	50
	Gulf de Persia	20	58	N	104	23
	Cape de Jasques	25	30	N	091	05
	Cape de Guadel	24	55	N	096	05
	Diul	24	32	N	100	25
	Cape Jaquack	22	40	N	100	55
	Surat	21	10	N	105	30
	Bombe Isle	19	18	N	005	00
	Goa	15	40	N	005	55
	Cape Comorin	17	28	N	008	35
	River Bengala	21	45	N	019	43
	Jambes	01	00	N	031	40

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coast in the East-Indies.	*Siam*	14	28	N	131	50
	Fort S. George	13	30	N	110	30
	Ralasor	21	30	N	117	10
	Cape Liampo	26	10	N	157	30
	Nanguſaque	32	00	N	158	50
	Canton in *China*	33	30	N	142	50
	Corea	35	40	N	154	00
Iſlands in the *Eaſt-Indies.*	S. *Maria* at S. end of *Madagaſcar*	25	30	S	072	30
	S. *Maria* at N. end of *Madagaſcar*	12	14	S	077	30
	Diego Roiz	19	10	S	088	25
	Mauritius	20	10	S	083	30
	Muſcarennus	21	36	S	081	40
	Timor	10	21	S	152	05
	Bantam in *Java*	06	16	S	133	40
	Java	07	40	S	143	20
	Sunda Straits	06	00	S	133	23
	Achem at the N. W. Point of *Sumatra*	05	55	N	124	05
	The South-eaſt end of *Sumatra*	05	55	S	133	01
	Macaſſer on the South end of *Celebes.*	05	30	S	147	40
	The South-end of *Gilolo*	01	35	S	154	42
	Naſſau Iſle	00	00	N	126	15
	Tidore	00	36	N	152	02
	Saltadores	03	30	N	172	40
	Cape Aert on the Eaſt-ſide of *Borneo.*	03	00	N	142	31
	Ouro	01	45	N	123	02
	Mindano City and Iſle	05	46	N	152	09
	Batuba	06	45	N	150	00
	Matan	08	40	N	171	20
	Cheraga	09	35	N	170	55
	Jaffanapatan Cape of Cylon	10	10	N	112	45
	Tandaia	12	40	N	120	11
	Mindora	13	24	N	148	00
	Malabrigo	18	30	N	171	15
	Aynam	19	15	N	137	40

	Places Names:	Latitude. D.	M.		Longit. D.	M
Islands in the East-Indies.	Formosa	23	34	N	147	35
	Tandesima by Japan	31	10	N	156	53
	Goto	32	40	N	155	08
	Firmando	33	15	N	158	00
	Straits of Zungaar	40	30	N	168	30
Coast of America in the South-Sea.	Cape Blanco	42	04	N	242	40
	Cape Barbara	36	35	N	251	00
	Cape S. Lucas	23	05	N	266	10
	Cape Corientes	20	23	N	273	30
	Cape Blanco	03	46	S	312	50
	Ambrose Isles	25	54	S	309	25
	Baldivia	40	00	S	312	15
	Castro	43	20	S	309	55
	Cape Victoria	52	50	S	306	20
	Cape Virginia	52	00	S	315	30
	Port Julian	48	30	S	316	20
	Cape Horn	57	50	S	318	10
The Coast of the Main Continent of America.	Strait Lemaire	55	26	S	318	00
	Cape Antonio	36	18	S	328	10
	Cape Maria	35	10	S	328	05
	Cape Blanco	02	20	S	351	15
	North Cape de Guiana	01	51	N	340	31
	Surinam	06	00	N	336	30
	Cape de Vela	12	10	N	318	20
	Nobre de Dios	09	42	N	310	30
	Panama	09	10	N	310	00
	Cape Gratias a Dios	14	10	N	307	30
	La Vera Cruz	19	55	N	295	30
	Cape Florida	24	30	N	307	30
	Ashly River	33	00	N	309	50
	Cape Fair	34	08	N	310	50
	Cape Henry	37	06	N	313	50
	James Town	37	05	N	312	50
	Cape Hatteras	35	20	N	314	00

	Places Names.	Latitude. D.	M.		Longitude. D.	M.
The Coast of the Main Continent of America.	Cape Charles	37	22	N	314	00
	Plimouth in New England	42	00	N	323	30
	Cape Cod	41	50	N	324	40
	Cape Ann	42	15	N	324	00
	Isle of Sables	44	17	N	324	00
	Cape Britain	45	24	N	335	00
	Cape Raze	46	30	N	341	40
	Cape Bona Vista	50	103	N	341	25
	Bell Isle	51	09	N	338	30
	Charleton Isle, in James's Bay	52	00	N	309	30
Islands in the West-Indies.	Bermudus	32	30	N	326	00
	Santa Cruz	17	42	N	338	00
	S. Christophers	17	30	N	329	00
	Antego	16	28	N	330	00
	Marigalanto	15	42	N	330	10
	Martineco	14	20	N	330	00
	Port Royal in Jamaica	17	50	N	312	15
	Barbadoes	13	24	N	331	30
	Tobago	10	54	N	332	20
	Trinidado	09	20	N	330	30
	Mevis	16	42	N	328	40
	Monserat	16	22	N	329	30
	Margaretta	11	00	N	321	30
	S. Domingo	18	30	N	327	05
	Cape Nicolao in Hispaniola	19	57	N	317	10
	Cape Antonio on Cuba	21	52	N	304	50
	The Havana on Cuba	23	28	N	307	00
	Isle of Asp	18	20	N	317	20

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